Environment Canada Environnement Canada

DIOXIN EXPERT WORKING GROUP FINAL REPORT

RECOMMENDATIONS FROM CYCLE 1 REVIEW

PREPARED FOR THE
EEM TECHNICAL MANAGEMENT COMMITTEE

EEM/1997/3

Canada

Publications relating to Environmental Effects Monitoring (EEM):

Aquatic Environmental Effects Monitoring Requirements (revised EPS 1/RM/18). Environment Canada. 1997. EEM/1997/1

Pulp and Paper Aquatic Environmental Effects Monitoring Requirements. (revised Annex 1). Environment Canada. 1997. Annex 1 to EEM/1997/1

Tracer Expert Working Group Report. EEM Technical Management Committee. 1997. EEM/1997/2 is also published as: Ali, N et al, 1997. Exposed or not exposed: the effectiveness of using tracers to verify exposure of fish to pulp and paper mill effluent. Canadian Technical Report of Fisheries and Aquatic Sciences 2162.

Dioxin Expert Working Group Report. EEM Technical Management Committee. 1997. EEM/1997/3

Usability of the Resources Expert Working Group Report. EEM Technical Management Committee. 1997. EEM/1997/4

Toxicology Expert Working Group Report. EEM Technical Management Committee. 1997. EEM/1997/5

Fish Survey Expert Working Group Report. EEM Technical Management Committee. 1997. EEM/1997/6

Benthic Invertebrate Community Expert Working Group Report. EEM Technical Management Committee. 1997. EEM/1997/7

Pulp and Paper Technical Guidance for Aquatic Environmental Effects Monitoring (revised). 1997. EEM/1997/8

Copies are available at:

National EEM Office
Science Policy and Environmental Quality Branch
Environmental Conservation Service
Environment Canada
Ottawa, Ontario, Canada
K1A 0H3
Tel.: (819) 997-1535 Fax: (819) 953-0461 Email: eem@ec.gc.ca

103-05631/

Note

The contents of this report are the views of the members of the Environmental Effects Monitoring (EEM) Expert Working Group. As well, the recommendations in this report are the result of the Expert Working Group process and represent the conclusions of the Expert Working Group.

The recommendations and decision trees put forward in this report will be submitted to the EEM Technical Management Committee (TMC). This information will be used by the TMC to produce the TMC recommendations for updates to the regulatory requirements of the EEM program.

The documents which will contain the revised regulatory requirements will be called:

- Aquatic Environmental Effects Monitoring Requirements, EEM/1997/1
- Pulp and Paper Aquatic Environmental Effects Monitoring Requirements, ANNEX 1 to EEM/1997/1

Acknowledgments

The EEM Technical Management Committee (TMC) extends its thanks to the members of the Expert Working Groups for their contribution to the EEM program. The members of the group have produced their reports in a very tight time frame and they have displayed a willingness to work together to meet common objectives.

The review performed by the Expert Working Groups and their recommendations for enhancements to the program are essential ensuring that the EEM program remains based on sound science.

Dioxin Expert Working Group Final Report for the Environmental Effects Monitoring Program

June 30, 1997

Mark Servos, Corinne Luthe, Al Colodey, Wayne Fairchild, Mike Ikonomou, Shelley Luce, Dave Sergeant, Sherry Walker

Environment Canada
EEM/1997/3

Dioxin Expert Working Group

Mark Servos (DOE-NWRI) (co-chair)
Corinne Luthe (PAPRICAN) (co-chair)

Al Colodey (DOE- Pacific & Yukon)
Wayne Fairchild (DFO-Maritimes)
Mike Ikonomou (DFO-Pacific & Yukon)
Shelley Luce (DOE-NWRI)
Dave Sergeant (DFO-GLLFAS)
Sherry Walker (DOE-Ottawa)

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1. Executive Summary

In this report, the Dioxins Expert Working Group reviews the issues identified during Cycle 1 of the Environmental Effects Monitoring (EEM) program and makes recommendations for future monitoring of dioxins to assess human-health concerns related to the consumption of contaminated fish. The Group reviewed the dioxins analyses from pulp and paper mills and found that generally freshwater mills across Canada and marine mills in Atlantic Canada had low to non-detectable levels of dioxins in fish. However, some BC marine mills had high levels of dioxins in crab hepatopancreas and fish liver. Numerous problems were identified in the sampling, analyses and reporting of Cycle 1 data. To address these problems, the Group has recommended clearer reporting requirements for the data, including QA/QC. As well, the following triggers are proposed by the Expert Working in future cycles:

1. Levels of dioxins in the previous cycle were below the consumption guidelines or there is no consumption guideline-related advisory/closure based on dioxin/furan contamination for any species or tissue in the receiving environment of the mill; and
2. The mill has been in compliance with the CEPA regulations for dioxins and furans in final mill effluent for the preceding 12 months.

At sites where the levels of dioxins reported are approaching the advisory guideline (e.g. within 30%), and there are no other supporting data or programs, the Regional Authorization Officers may require that dioxin analysis be included in the next cycle of EEM.

2. Introduction

Dioxin analysis is a component of the EEM program under the Pulp and Paper Effluent Regulations under the Fisheries Act to assess impacts on the usability of fisheries resources. An indirect purpose of the dioxin analysis is to assess the effectiveness of the Pulp and Paper Mill Effluent Chlorinated Dioxins and Furans Regulations implemented under the Canadian Environmental Protection Act (CEPA). Under CEPA, pulp and paper mill effluents are to have "non-measurable" dioxins as defined in the regulations (Appendix I; Pulp and Paper Mill Effluent Chlorinated Dioxins and Furans Regulations, Department of the Environment, Canada Gazette II Vol. 126(11):1940-1954, SOR/DORS/92-267, May 20, 1992). Over the last few years the industry has reacted quickly to implement process and treatment strategies to eliminate dioxins from final effluents. This has included a number of strategies such as: removal of precursors, elimination of chlorophenol contaminated wood chips and the replacement of molecular chlorine by chlorine dioxide in the bleaching process. In a number of case studies, the dioxin levels in the effluent and biota in the receiving environment have dropped dramatically. However, there are a number of sites where these reductions have not been realized. The dioxin component of the EEM program was designed to collect a national database from which general conclusions regarding the extent of the success of the regulations and the efforts by industry.

For the purposes of this report the following definitions are used:

Dioxin: refers to all 2,3,7,8-substituted polychlorinated dibenzo-*p*-dioxins and dibenzofurans.

Fish: refers to finfish and shellfish.

2.1 Dioxin Working Group Terms of Reference

2.1.1 Purpose

The regions, the mills and the consultants have identified difficulties with some of the Environmental Effects Monitoring (EEM) requirements provided under the Cycle 1 "baseline" monitoring program. To address these concerns, the EEM Technical Management Committee established Expert Working Groups to review the results of Cycle 1 evaluation, identify the technical difficulties and provide recommendations on modified or alternative approaches where existing approaches have proven to be unproductive or do not work. The recommendations from this Expert Working Group will provide the basis for the Cycle 2 requirements on dioxins and furans. The Terms of Reference are found in Appendix II. This report represents the consensus findings and recommendations of the Dioxins Expert Working Group.

2.1.2 Objectives

The objectives of the Expert Working Group were to:

- review the concept and purpose of the various requirements under the EEM program,
- review the dioxin and furan data as generated in Cycle 1;
- identify the difficulties encountered by the consultants in meeting the program requirements;
- identify any sampling related difficulties and provide alternative approaches;
- identify any QA/QC related difficulties and provide alternative approaches;
- examine the rationale for sampling frequency and sampling where historical data indicates tissue dioxin levels below fish consumption guidelines;
- examine how a site-specific approach could be implemented for dioxins and furans;
- provide any other recommendations pertaining to dioxins and furans that will improve the quality and value of the data to be generated in Cycle 2.

2.2 Overview of the Process

The Dioxin Expert Working Group was established in the fall of 1996 to review the results of Cycle 1 dioxin sampling element of the EEM program. The Working Group is co-chaired by an industry and a government representative and includes experts in the analysis and environmental chemistry of dioxins, fate and accumulation of dioxins, and the design of monitoring programs. The goal of the Expert Working Group was not to evaluate the quality of each analysis but to make general observations and recommendations for Cycle 2. The Expert Working Group collected the data from each of the EEM reports that were available regarding dioxins, collated them into summary tables, identified the problems and made recommendations for Cycle 2 and amendments to Annex 1. The Expert Working Group also considered the regional reports and recommendations. A number of additional questions were identified and are addressed in this report:

- Should dioxins continue to be part of the EEM program?

- If dioxins are included in Cycle 2, how can the program be improved to provide the desired data?
- Should the program continue at all sites and, if not, what criteria should be used to exempt mills from this section of the EEM?

3. Review of Discussions of Cycle 1 Issues

3.1 Problems Identified in Cycle 1

A number of concerns and problems have been identified with the Cycle 1 dioxin and furan data. Cycle 2 dioxin sampling and reporting requirements will evolve after examining these problems and issues.

- Some mills did not use a sport or commercially important species for the dioxin analysis even though in most cases at least one sentinel species used for the Adult Fish Survey (AFS) was a sport/commercial fish.
- Biological data, although not required in Cycle 1, were not reported in many cases. In many instances the same fish were used as in the AFS, but the sample identification was not included for the fish that made up the composite. Therefore the sex, size, age etc. of the fish were unknown.
- There is only a single composite sample of a single species from each mill. This does not allow any evaluation of the variability in the system including within a species population or among species. The data are therefore extremely limited.
- Data for a few sites are/were not available to the Expert Working Group for consideration. The report for one mill was not available. However, data from other sources at this mill indicate very low levels.
- The marine sites in BC reported dioxins levels in liver and hepatopancreas rather than fillets. This is a result of the data being generated by a different requirement and substituted as equivalent for the EEM. Although this makes it difficult to render direct comparisons, it does not prevent an assessment of the Cycle 1 results.
- Lipid levels are not always reported. Lipid is an important factor in determining the body burdens of dioxins in fish since dioxins are extremely lipophilic and partition strongly into this compartment. Reporting of lipid levels was not a requirement in Cycle 1 but would have greatly enhanced the potential interpretation of data. Lipid normalization could help interpreting the differences between sites, species and tissues.
- QA/QC reporting was inconsistent and often inadequate. Very little guidance was given in Annex 1 on what QA/QC and supporting data were required.
- Addressing historical *versus* current outputs was identified as a concern for interpretation of the Cycle 1 results. It was pointed out that in several cases there are no longer any detectable dioxins in the mill's final effluent discharge. The contamination of fish in the receiving environment is likely due to the historical contamination of sediments which remain bioavailable.
- At least one example was discussed where the EEM reported no detectable dioxins in fish immediately downstream of the pulp mill discharge but research studies at the same site have reported levels above the consumption guidelines in other species, tissues or far field sites.
- It is assumed that the International TEFs were used in all cases to determine the TEQs but this is not reported.

3.2 Identification of the Successful Elements of Cycle 1

All mills were able to collect and have samples analyzed for dioxin concentrations. Despite a number of problems identified in Cycle 1, particularly the reporting of QA/QC, the data provided were adequate to make some general conclusions and recommendations for Cycle 2.

3.3 Available Alternatives

There was very little guidance provided in Annex 1 as to how dioxin should be reported in Cycle 1. In most cases the samples were probably analyzed in a professional and accurate fashion even though insufficient QA/QC information was provided to adequately evaluate the results. Recommendations are being made to ensure that adequate information is provided to evaluate the quality of the data in future EEM cycles. The weight of evidence suggests that even though there were some minor problems with QA/QC they would not have changed the conclusions.

The scientific literature supports the conclusion that discharges of dioxins have been reduced dramatically at pulp and paper mills and that the local receiving environments have also responded as a consequence. This finding lends additional support for allowing mills to be exempted from further testing even though there are limited data available from the EEM program. Although problems were identified with Cycle 1 of the EEM program, there were no mills discharging into freshwater environments that found elevated levels of dioxins in the composite fish sample. Even if other fish species had been selected and analyzed, it is unlikely that these mill sites would have exceeded the federal consumption guidelines. For marine mills, no elevated levels of dioxins were found in Atlantic Canada. However, no lobster or crab hepatopancreas and fish livers were sampled. Levels of dioxins in crab hepatopancreas and fish livers above Health Canada guidelines were reported from 5 of 9 mills sampled in BC (see Appendix IV). Approximately 1200 km^2 of the BC coastline continues to have dioxin-related restrictions for consumption of fish and shellfish.

Since there were numerous sites where the dioxin levels in biota exceeded the Health Canada consumption guidelines, it was deemed necessary in future EEM cycles to continue evaluating the adequacy of the Pulp and Paper Effluent Regulations to assess impacts on the usability of fisheries resources and the CEPA regulations to control dioxins discharges from pulp and paper mills. However, it was considered desirable to determine triggers to allow mills to be exempted from the dioxin requirement in Cycle 2 if they were considered "clean". It was deemed inappropriate to continue to conduct dioxin analysis at sites where there was obviously no dioxin problem in the fish and there would therefore be no further benefit in continuing the program at these sites. There was some concern that mills that did not meet the QA/QC in Cycle 1 should be exempted. Although this remains a concern, the data do not suggest that a problem exists at most sites. The sites where dioxins are high, already have advisories and would therefore not be exempted from the next cycle. Although there were some minor inconsistencies in the QA/QC of some of the freshwater mills, it is very unlikely that in any of these cases the dioxin values would have exceeded the advisory levels. In addition, it is unlikely that a mill with elevated levels would not have an advisory based on other sampling done earlier, including the National Dioxin Program completed in the early 1990's. The assessment of the quality/adequacy of QA/QC of

any EEM cycle should be based on professional judgment. Failure to provide adequate analysis should be a reason for rejecting the data and requiring the mill to provide adequate data within that current cycle. However, there is nothing to be gained by having mills with minor variances in QA/QC etc. in Cycle 1, doing Cycle 2.

It is difficult to select a trigger level, but since the ultimate goal is to achieve the removal of any fish consumption guideline-related advisories/closures, the fish consumption guideline seems a logical target (see Appendix IV). Any future changes to the guideline will logically lead to changes in sampling requirements. The alternative trigger of achieving reference or non-detectable dioxins levels, however, is overly stringent and may take decades to achieve. A complicating situation is the one of historical contamination. Many mills may have non-detectable concentrations of dioxin in their final effluent discharge, but significant contamination in sediments from past effluent discharges, and this may result in elevated dioxin levels in the biota. However, information on levels in biota is essential in order to remove any dioxin-related fish consumption restrictions. This consumption guideline-related trigger would also ensure that any new information resulting in an advisory/closure would be reported in the EEM and potentially initiate additional sampling.

Since it is the CEPA Effluent Regulation that is being evaluated, it is reasonable to require mills that have failed to meet the Regulation to sample dioxins in the following cycle. For example, in 1995, 2 mills exceeded the dioxin regulatory level and 7 mills exceeded the furan regulatory level (Environment Canada, 1997). In some cases this requirement may include mills that do not have levels in biota exceeding the consumption guidelines. Including non-compliance with CEPA effluent dioxin regulations as a trigger, ensures that mills which continue to discharge dioxins above the CEPA level, are evaluated. The data provided in the EEM, based on a single composite sample, are not considered adequate to draw a conclusion at an individual mill, particularly if the mill is not meeting the CEPA effluent dioxin regulations. This trigger would also ensure that any changes in a mill that result in non-compliance with CEPA dioxins effluent regulations are evaluated.

The following triggers for including mills in future cycles are suggested:
1. Levels of dioxins in the previous cycle were below the consumption guidelines or there is no consumption guideline-related advisory/closure based on dioxin/furan contamination for any species or tissue in the receiving environment of the mill; and
2. The mill has been in compliance with the CEPA regulations for dioxins and furans in final mill effluent for the preceding 12 months.

While the limited data provided in Cycle 1 of the EEM program are not considered adequate to draw a conclusion at an individual mill, particularly if the mill is not meeting the CEPA effluent dioxin regulations, the situation is quite different at mills complying with CEPA and having no mill-related advisories/closures. For freshwater mills, an extremely good relationship exists between meeting these two triggers and having very low or non-detectable dioxins in Cycle 1. This information removes a lot of the uncertainty associated with conclusions based upon one composite sample. However, at sites where the levels of dioxins reported are approaching the advisory guideline and there are no other supporting data or programs, the Regional Authorization Officers may require that dioxin analysis be included in the next cycle of EEM. Levels approaching the guideline would normally be defined as being within 30% of the guideline value. This is based on the variability normally experienced among individuals in an exposed population.

4. Summary and Conclusions

Numerous problems were identified in the Cycle 1 process and data. However, adequate solutions have been recommended to correct these in future cycles without significant cost or major changes to the program. The two major areas are the introduction of two triggers to include mills in future cycles and clearer reporting requirements for the data, including QA/QC. Despite numerous limitations with the data from Cycle 1, some general conclusions could be made:

- The freshwater mills generally showed low (generally <1ppt, although some sites are slightly higher) to non-detectable levels of dioxins in fish samples analyzed.
- Fish samples from mills in Atlantic Canada had low or undetectable levels of dioxins, but no lobster or crab hepatopancreas were sampled.
- The BC marine bleached kraft mills show non-detectable to high dioxin levels in crab hepatopancreas or fish liver (<1 to 2949 ppt) .

5. Recommendations

Several weaknesses were identified in the Cycle 1 data. In particular, the QA/QC was problematic. It is recommended that the supporting QA/QC which may have been omitted in the Cycle 1 reports be provided. The dioxin data provided in Cycle 1 should be considered incomplete if the supporting QA/QC is not met and/or can not be provided. The following recommendations for future cycles are proposed.

5.1 Recommended Requirements for Cycle 2

Dioxin analysis in Cycle 2 must be conducted according to the enhanced QA/QC requirements outlined in section 5.2 unless it can be shown by the mill that:

1. Levels of dioxins in the previous cycle were below the consumption guidelines or there is no consumption guideline-related advisory/closure based on dioxin/furan contamination for any species or tissue in the receiving environment of the mill; and
2. The mill has been in compliance with the CEPA regulations for dioxins and furans in final mill effluent for the preceding 12 months.

At sites where the levels of dioxins reported are approaching the advisory guideline and there are no other supporting data or programs, the Regional Authorization Officers may require that dioxin analysis be included in the next cycle of EEM.

Data collected for purposes other than the EEM may be substituted if they:

- were collected after the completion of the previous cycle, and
- meet the minimum QA/QC requirements as outlined in Annex 1, and
- are equivalent to the sampling requirements (i.e., composite of 10 fish), and
- are reported with supporting data and information in the EEM document.

5.2 Recommended Changes for Annex 1 Document

The following should be made requirements and stated specifically in Annex 1:

- Emphasis should be made on using an important commercial or sport fish species. Lobster or crab hepatopancreas, if available, must be sampled in marine areas. If a commercial or sport fish/shellfish is not available, a species that has been historically monitored may be substituted. If an alternative species is used, a justification must be included in the report.
- Fish collected should be adults.
- Tissue selected should be edible portion, specifically fillet in finfish and hepatopancreas in crab or lobster.
- Length, weight, sex and age (if possible) of the fish making up the composite samples must be reported.
- Reporting structure and QA/QC must be stipulated and reference made to the Environment Canada documents RM 19 and 23 (see 5.2.1).
- Lipid values for tissues analyzed must be reported (see 5.2.1, Number 11).
- Composite samples must be made up using an equal wet weight of tissue from each fish (see 5.2.2).

5.2.1 QA/QC Requirements for Dioxin Analysis

List of QA/QC criteria for dioxin EWG.

1. All dioxin/furan analyses must be performed by high resolution gas chromatography-high resolution mass spectrometry (HRGC/HRMS).
2. All data reporting must be done as per Environment Canada Report EPS 1/RM/23, October 1992, Figure 3. An equivalent format is acceptable if all information is provided.
3. Instrument detection limits must be reported for at least the 2,3,7,8-TCDD congener.
4. Method detection limits (MDLs) must be reported for all the 2,3,7,8 PCDDs/PCDFs. Minimum requirement for MDLs are those postulated in the Environment Canada Report EPS 1/RM/23, October 1992, Table 1.
5. Composition of every sample batch that the submitted samples were processed in must be provided. Bathes of 12 samples are preferable, and must contain a procedural blank, a CRM or an in-house spiked sample, one replicate, and 9 real samples.
6. Data for the glassware blank associated with each of the samples analyzed must be provided. It must also meet the EPS 1/RM/19 criteria, Section 8a on page 37.
7. The procedural blank must be submitted with each sample batch and must meet the EPS 1/RM/19 criteria, Section 8e on page 37. Contamination levels of individual 2,3,7,8-substituted tetra, penta, hexa, hepta, and octa CDD/CDF must not exceed 1.5, 3, 3, 5, 10 pg/sample respectively.
8. Each batch of 12 samples (as specified in #5) must have one sample analyzed twice (a replicate). Acceptable precision for replicate analysis must be better than $\pm$15% for sample concentrations of 5 pg/g and higher and $\pm$30% for sample concentrations lower than 5 pg/g.

9. The acceptable percent recoveries for the surrogate method internal standards must be those postulated in the Environment Canada Report EPS 1/RM/23, October 1992, Table 2. For OCDD surrogate recoveries should be between 35-120%.

10. Each batch of 12 samples (as specified in #5) should contain a certified reference material (CRM, or an in-house spiked sample) and an analytical report must be provided that outlines the measured concentrations and their % deviation/recovery from the expected concentrations. For congeners with concentrations higher than 1 pg/g the percent deviation must be less than ±20% from the expected concentration. For in-house spiked samples this will reflect the spiked concentrations and for CRMs this will reflect deviation from the mean of the consensus value.

11. Percent lipid and percent moisture determinations must be provided for every sample submitted. Also percent lipid values should be reported for the replicates analyzed in the same batch with the submitted sample. The percent lipid precision for the replicate samples must be ±30% for tissues containing more than 2% and ±60% for tissues with less than 2% lipid. The method for the lipid determinations must be reported and the solvents used must be clearly specified.

5.2.2 Composite samples

Composite samples must be made up using an equal wet weight of tissue from each fish. Samples are to be homogenized and a subsample taken for dioxin and lipid analysis.

5.3 Recommended Research Elements for Future Cycles

- A study of the spatial differences in the contaminant burdens relative to factors such as depositional areas, habitat, etc. should be done to determine if sampling at the near field is appropriate. In particular, a study of the estuary environments in Atlantic Canada should be done to examine the variability among the species and locations relative to the mixing zones and depositional zones.

- The dioxin results from the National Dioxin Program conducted in the early 1990's should be completed by DFO and the data made available to the EEM Expert Working Groups.

- A study should be conducted to review the current status of dioxins in the receiving waters of pulp and paper mills, and compare the historical results to the current EEM results.

The following research needs were identified by individuals in the Expert Working Group but given a lower priority and consensus was not reached.

- Factors which control the distribution, fate and bioavailability of dioxins should be studied to help determine the time course of recovery for sites that have met the CEPA regulation but continue to have elevated dioxin levels.

- Studies should be conducted to evaluate/determine the variability among species at pulp and paper mill impacted sites to validate that the most appropriate species are being used.

6. References

Environment Canada. 1997. Status Report on Dioxin-Furan Effluent Control by the Pulp and Paper Industry (1992-1995). Prepared by the National Office of Pollution Prevention. Draft Report.

Environment Protection Series Report EPS 1/RM/19, February 1992. Reference Method for the Determination of Polychlorinated Dibenzo-para-dioxins (PCDDs) and Polychlorinated Dibenzofurans (PCDFs) in pulp and Paper mill Effluents.

Environment Protection Series Report EPS 1/RM/23, October 1992. Internal Quality Assurance Requirements for the Analysis of Dioxins in Environmental Samples.

Appendix I: Pulp and Paper Mill Effluent Chlorinated Dioxins and Furans Regulations

Registration
SOR/92-267 7 May, 1992

CANADIAN ENVIRONMENTAL PROTECTION ACT

Pulp and Paper Mill Effluent Chlorinated Dioxins and Furans Regulations

P.C. 1992-959 7 May, 1992

Whereas, pursuant to subsection 48(1) of the Canadian Environmental Protection Act*, the Minister of the Environment published in the *Canada Gazette* Part I on December 14, 1991 a copy of the proposed Regulations respecting the release of polychlorinated dibenzo-para-dioxins and polychlorinated dibenzofurans in effluents from pulp and paper mills, and amending the List of Toxic Substances in Schedule I to the Canadian Environmental Protection Act*, substantially in the form annexed hereto;

And Whereas, in the opinion of the Governor in Council, pursuant to subsection 34(3) of the Canadian Environmental Protection Act*, the annexed Regulations do not regulate an aspect of any substance that is regulated by or under any other Act of Parliament;

Therefore, His Excellency the Governor General in Council, pursuant to section 34** of the Canadian Environmental Protection Act*, on the recommendation of the Minister of the Environment and the Minister of National Health and Welfare and after the federal-provincial advisory committee has been given an opportunity to provide its advice under section 6 of the Act*, is pleased hereby to make the annexed Regulations respecting the release of polychlorinated dibenzo-para-dioxins and polychlorinated dibenzofurans in effluents from pulp and paper mills, and amending the List of Toxic Substances in Schedule I to the Canadian Environmental Protection Act*.

REGULATIONS RESPECTING THE RELEASE OF POLYCHLORINATED DIBENZO-PARA-DIOXINS AND POLYCHLORINATED DIBENZOFURANS IN EFFLUENTS FROM PULP AND PAPER MILLS, AND AMENDING THE LIST OF TOXIC SUBSTANCES IN SCHEDULE I TO THE CANADIAN ENVIRONMENTAL PROTECTION ACT

Short Title

1. These Regulations may be cited as the *Pulp and Paper Mill Effluent Chlorinated Dioxins and Furans Regulations*.

* R.S., c. 16 (4th Supp.)
** S.C. 1989, c. 9, s. 2

Enregistrement
DORS/92-267 7 mai 1992

LOI CANADIENNE SUR LA PROTECTION DE L'ENVIRONNEMENT

Règlement sur les dioxines et les furannes chlorés dans les effluents des fabriques de pâtes et papiers

C.P. 1992-959 7 mai 1992

Attendu que, conformément au paragraphe 48(1) de la Loi canadienne sur la protection de l'environnement*, le ministre de l'Environnement a fait publier dans la *Gazette du Canada* Partie I le 14 décembre 1991 le projet de Règlement concernant les rejets de dibenzo-para-dioxines polychlorées et de dibenzofurannes polychlorés dans les effluents des fabriques de pâtes et papiers et visant à modifier la liste des substances toxiques de l'annexe I de la Loi canadienne sur la protection de l'environnement*, conforme en substance au texte ci-après;

Attendu que, conformément au paragraphe 34(3) de cette loi, le gouverneur en conseil est d'avis que le règlement ci-après ne vise pas un point déjà réglementé sous le régime d'une autre loi fédérale,

À ces causes, sur recommandation du ministre de l'Environnement et du ministre de la Santé nationale et du Bien-être social, en vertu de l'article 34** de la Loi canadienne sur la protection de l'environnement* et après que le comité consultatif fédéro-provincial s'est vu accorder la possibilité de formuler ses conseils dans le cadre de l'article 6 de cette loi, il plaît à Son Excellence le Gouverneur général en conseil de prendre le Règlement concernant les rejets de dibenzo-para-dioxines polychlorées et de dibenzofurannes polychlorés dans les effluents des fabriques de pâtes et papiers et visant à modifier la liste des substances toxiques de l'annexe I de la Loi canadienne sur la protection de l'environnement*, ci-après.

RÈGLEMENT CONCERNANT LES REJETS DE DIBENZO-PARA-DIOXINES POLYCHLORÉES ET DE DIBENZOFURANNES POLYCHLORÉS DANS LES EFFLUENTS DES FABRIQUES DE PÂTES ET PAPIERS ET VISANT À MODIFIER LA LISTE DES SUBSTANCES TOXIQUES DE L'ANNEXE I DE LA LOI CANADIENNE SUR LA PROTECTION DE L'ENVIRONNEMENT

Titre abrégé

1. *Règlement sur les dioxines et les furannes chlorés dans les effluents des fabriques de pâtes et papiers.*

* L.R., ch. 16 (4e suppl.)
** L.C. 1989, ch. 9, art. 2

Interpretation

2. In these Regulations,

"Act" means the *Canadian Environmental Protection Act*; (*Loi*)

"chlorine bleaching plant" means a plant in a mill where pulp is bleached by chlorine or chlorine dioxide; (*usine de blanchiment au chlore*)

"effluent flowrate" means the quantity of an effluent produced by a mill in one day, measured in cubic metres; (*débit*)

"final effluent" means any water that contains intermediate effluent that is released from a mill and discharged directly into the environment or into an off-site treatment system; (*effluent terminal*)

"intermediate effluent" means any water that is released during any of the processes in a chlorine bleaching plant; (*effluent intermédiaire*)

"measurable concentration of 2,3,7,8-TCDD" means a concentration of 2,3,7,8-TCDD that is greater than the level of quantification as defined in the Reference Method; (*concentration mesurable de 2,3,7,8-TCDD*)

"measurable concentration of 2,3,7,8-TCDF" means a concentration of 2,3,7,8-TCDF that is greater than the level of quantification as defined in the Reference Method and that, when multiplied by 0.1, exceeds 5 ppq; (*concentration mesurable de 2,3,7,8-TCDF*)

"mill" means a factory that contains a chlorine bleaching plant and that produces pulp or paper products, and any effluent treatment plant that is owned by the owner of that factory; (*fabrique*)

"off-site treatment system" means an effluent treatment plant, other than a mill, that treats final effluent from a mill; (*installation extérieure de traitement*)

"operator" means the person in charge of the operation of a mill; (*exploitant*)

"paper products" includes paper, coated paper, paperboard, hardboard, boxboard, linerboard, insulating board, building board, corrugated medium, tissue or moulded cellulose product but does not include a regenerated cellulose product; (*produits du papier*)

"ppq" means parts per quadrillion, being parts per 10^{15} parts; (*ppq*)

"Reference Method" means the *Reference Method for the Determination of Polychlorinated Dibenzo-para-dioxins (PCDDs) and Polychlorinated Dibenzofurans (PCDFs) in Pulp Mill Effluents*, published by the Department of the Environment, Report EPS 1/RM/19, 1991, as amended from time to time; (*méthode de référence*)

"2,3,7,8-substituted PCDDs" means any polychlorinated dibenzo-para-dioxin that has the molecular formula $C_{12}H_{8-n}Cl_nO_2$, in which "n" is not less than 4 and not more than 8 and chlorine atoms are located at the 2,3,7,8 positions on the molecule; (*PCDD chlorées aux positions 2,3,7 et 8*)

"2,3,7,8-substituted PCDFs" means any polychlorinated dibenzofuran that has the molecular formula $C_{12}H_{8-n}Cl_nO$,

Définitions

2. Les définitions qui suivent s'appliquent au présent règlement.

«concentration mesurable de 2,3,7,8-TCDD» Concentration de 2,3,7,8-TCDD qui est supérieure à la limite de dosage définie dans la méthode de référence. (*measurable concentration of 2,3,7,8-TCDD*)

«concentration mesurable de 2,3,7,8-TCDF» Concentration de 2,3,7,8-TCDF qui est supérieure à la limite de dosage définie dans la méthode de référence et qui, lorsque multipliée par 0,1, dépasse 5 ppq. (*measurable concentration of 2,3,7,8-TCDF*)

«débit» Quantité d'un effluent produite en un jour par une fabrique, mesurée en mètres cubes. (*effluent flowrate*)

«effluent intermédiaire» Eaux rejetées pendant n'importe lequel des procédés appliqués dans une usine de blanchiment au chlore. (*intermediate effluent*)

«effluent terminal» Toute eau contenant un effluent intermédiaire, rejetée par une fabrique et déversée directement dans l'environnement ou dans une installation extérieure de traitement. (*final effluent*)

«exploitant» La personne responsable de l'exploitation d'une fabrique. (*operator*)

«fabrique» Usine qui renferme une usine de blanchiment au chlore et qui fabrique de la pâte ou des produits du papier; y est assimilée toute usine de traitement d'effluent qui appartient au propriétaire de la fabrique. (*mill*)

«installation extérieure de traitement» Usine de traitement d'effluent, autre qu'une fabrique, qui traite l'effluent terminal d'une fabrique. (*off-site treatment system*)

«Loi» La Loi canadienne sur la protection de l'environnement. (*Act*)

«méthode de référence» La *Méthode de référence pour le dosage des polychlorodibenzo-para-dioxines (PCDD) et des polychlorodibenzofuranes (PCDF) dans les effluents des usines des pâtes et papiers*, publiée par le ministère de l'Environnement, Rapport SPE 1/RM/19, 1991, avec ses modifications successives. (*Reference Method*)

«PCDD chlorées aux positions 2,3,7 et 8» Dibenzo-para-dioxines polychlorées dont la formule moléculaire est $C_{12}H_{8-n}Cl_nO_2$, où «n» est au moins 4 et au plus 8 et où les positions 2,3,7,8 de la molécule sont occupées chacune par un atome de chlore. (*2,3,7,8-substituted PCDDs*)

«PCDD totales» Somme des concentrations de tous les congénères des dibenzo-para-dioxines polychlorées dont la formule moléculaire est $C_{12}H_{8-n}Cl_nO_2$, où «n» est au moins 4 et au plus 8. (*total PCDDs*)

«PCDF chlorés aux positions 2,3,7 et 8» Dibenzofurannes polychlorés dont la formule moléculaire est $C_{12}H_{8-n}Cl_nO$, où «n» est au moins 4 et au plus 8 et où les positions 2,3,7,8 de la molécule sont occupées chacune par un atome de chlore. (*2,3,7,8-substituted PCDFs*)

«PCDF totaux» Somme des concentrations de tous les congénères des dibenzofurannes polychlorés dont la formule moléculaire est $C_{12}H_{8-n}Cl_nO$, où «n» est au moins 4 et au plus 8. (*total PCDFs*)

in which "n" is not less than 4 and not more than 8 and chlorine atoms are located at the 2,3,7,8 positions on the molecule; (*PCDF chlorés aux positions 2,3,7 et 8*)

"total PCDDs" means the sum of the concentrations of all polychlorinated dibenzo-para-dioxin congeners that have the molecular formula $C_{12}H_{8-n}Cl_nO_2$, in which "n" is not less than 4 and not more than 8; (*PCDD totales*)

"total PCDFs" means the sum of the concentrations of all polychlorinated dibenzofuran congeners that have the molecular formula $C_{12}H_{8-n}Cl_nO$, in which "n" is not less than 4 and not more than 8; (*PCDF totaux*)

"2,3,7,8-TCDD" means 2,3,7,8-tetrachlorodibenzo-para-dioxin; (*2,3,7,8-TCDD*)

"2,3,7,8-TCDF" means 2,3,7,8-tetrachlorodibenzofuran. (*2,3,7,8-TCDF*)

Owner of a Mill

3. The owner of a mill shall ensure that the operator operates the mill in accordance with these Regulations.

Prohibition

4. (1) Subject to subsection (2), effective July 1, 1992, no operator shall release or permit to be released into the environment final effluent that contains any measurable concentration of 2,3,7,8-TCDD or measurable concentration of 2,3,7,8-TCDF.

(2) Subsection (1) does not apply before January 1, 1994 to an operator in charge of a chlorine bleaching plant that commenced operation before June 1, 1990 who submits to the Minister, within 60 days after the coming into force of these Regulations, plans, specifications and schedules for the implementation of measures that will enable the operator to achieve compliance with subsection (1).

Analyses

5. For the purposes of these Regulations, samples shall be taken and concentrations shall be measured in accordance with the Reference Method.

Monitoring and Reporting

6. (1) Effective July 1, 1992, the operator shall take samples of the final effluent in accordance with the sampling schedule for final effluent set out in Schedule I.

(2) Effective July 1, 1992, the operator shall report to the Minister the concentrations of the substances set out in Schedule II that are in the final effluent samples, and the effluent flowrate of the final effluent.

Information

7. (1) The Minister may, in writing, request that the operator conduct, within the time set out in the request,

«ppq» Parties par quadrillion, soit parties par 10^{15} parties. (*ppq*)

«produits du papier» Vise notamment le papier, le papier couché, le carton, le carton fibre, le carton pour boîtes, le carton doublure, le carton isolant, le carton de construction, le carton à onduler, le papier de soie et les produits de cellulose moulée; ne vise pas cependant les produits de cellulose régénérée. (*paper product*)

«usine de blanchiment au chlore» Installation dans une fabrique où la pâte est blanchie par le chlore ou le bioxyde de chlore. (*chlorine bleaching plant*)

«2,3,7,8-TCDD» 2,3,7,8-tétrachlorodibenzo-para-dioxine. (*2,3,7,8-TCDD*)

«2,3,7,8-TCDF» 2,3,7,8-tétrachlorodibenzofuranne. (*2,3,7,8-TCDF*)

Propriétaire d'une fabrique

3. Le propriétaire d'une fabrique doit veiller à ce que l'exploitant la fasse fonctionner conformément au présent règlement.

Interdiction

4. (1) Sous réserve du paragraphe (2), à compter du 1er juillet 1992, il est interdit à l'exploitant de rejeter ou d'autoriser que soit rejeté dans l'environnement un effluent terminal qui contient une concentration mesurable de 2,3,7,8-TCDD ou une concentration mesurable de 2,3,7,8-TCDF.

(2) Le paragraphe (1) ne s'applique qu'à compter du 1er janvier 1994 à l'égard de l'exploitant responsable d'une usine de blanchiment au chlore mise en exploitation avant le 1er juin 1990 qui fournit au ministre, dans les 60 jours suivant l'entrée en vigueur du présent règlement, les plans, devis et calendriers de la mise en application des mesures lui permettant de respecter l'interdiction prévue au paragraphe (1).

Analyse

5. Pour l'application du présent règlement, les échantillons sont prélevés et les concentrations sont mesurées conformément à la méthode de référence.

Contrôle et rapports

6. (1) À compter du 1er juillet 1992, l'exploitant doit prélever des échantillons de l'effluent terminal conformément au calendrier d'échantillonnage établi à l'annexe I.

(2) À compter du 1er juillet 1992, l'exploitant doit communiquer au ministre les concentrations des substances énumérées à l'annexe II qui sont présentes dans les échantillons de l'effluent terminal, ainsi que le débit de cet effluent.

Renseignements

7. (1) Le ministre peut, par un avis écrit, demander à l'exploitant d'effectuer, dans le délai qu'il précise :

(*a*) specified tests to determine the presence of PCDDs and PCDFs in the final effluent, intermediate effluent and in the pulp and sludge produced in the mill;

(*b*) specified tests to determine the effect of operating conditions in the mill on the concentration of PCDDs and PCDFs; and

(*c*) toxicological studies on the final effluent, intermediate effluent and in the pulp and sludge produced in the mill.

(2) The Minister may, in writing, request that the operator submit, within the time set out in the request,

(*a*) results of the tests and studies conducted pursuant to subsection (1); and

(*b*) information relating to the presence of PCDDs and PCDFs in the final effluent, intermediate effluent and in the pulp and sludge produced in the mill and relating to the operating conditions of the mill.

(3) The operator shall conduct any test and study and submit any information requested by the Minister pursuant to subsection (1) or (2) within the time set out in the request.

(4) The information specified in subsection 6(2) shall be submitted to the Minister within 60 days after the day on which any sample is taken pursuant to Schedule I.

(5) An operator who submits to the Minister information respecting the concentration of substances pursuant to subsection 6(2) shall also submit the information required by the Reference Method.

(6) The information referred to in section 6 shall be submitted in writing or in an electronic format, where the electronic format is provided by the Department of the Environment.

(7) Any report or information that is submitted to the Minister pursuant to this section shall be signed by the operator.

Amendment of the List of Toxic Substances in Schedule I to the Act

8. All that portion of item 16[1] of the List of Toxic Substances in Schedule I to the Act in column II thereof is renumbered as paragraph (*a*) thereof and item 16 is further amended by adding thereto, in column II thereof, the following paragraph:

Item	Column II Type of Regulation Applicable
16.	"(*b*) Maximum concentrations that may be released into the environment"

[1] SOR/92-266, 1992 *Canada Gazette* Part II, p. 1939

a) les essais indiqués qui permettent de déceler la présence de PCDD et de PCDF dans l'effluent terminal, l'effluent intermédiaire et les pâtes et boues produites dans la fabrique;

b) les essais indiqués qui permettent de déterminer l'effet des conditions d'exploitation de la fabrique sur les concentrations de PCDD et de PCDF;

c) des études toxicologiques sur l'effluent terminal, l'effluent intermédiaire et les pâtes et boues produites dans la fabrique.

(2) Le ministre peut, par un avis écrit, demander à l'exploitant de lui transmettre, dans le délai qu'il précise :

a) les résultats des essais et des études effectués conformément au paragraphe (1);

b) des renseignements sur la présence de PCDD et de PCDF dans l'effluent terminal, l'effluent intermédiaire et les pâtes et boues produites dans la fabrique, ainsi que sur les conditions d'exploitation de la fabrique.

(3) L'exploitant doit obtempérer à la demande du ministre faite en application des paragraphes (1) ou (2), dans le délai que celui-ci a précisé.

(4) Les renseignements visés au paragraphe 6(2) sont transmis au ministre dans les 60 jours suivant la date à laquelle les échantillons sont prélevés conformément à l'annexe I.

(5) L'exploitant qui transmet au ministre les renseignements sur les concentrations visés au paragraphe 6(2) doit également fournir les renseignements qu'exige la méthode de référence.

(6) Les renseignements visés à l'article 6 sont transmis par écrit ou sous forme électronique, lorsque le modèle de présentation électronique des données est fourni par le ministère de l'Environnement.

(7) Les renseignements transmis au ministre conformément au présent article doivent porter la signature de l'exploitant.

Modification de la liste des substances toxiques de l'annexe I de la Loi

8. La colonne II de l'article 16[1] de la liste des substances toxiques de l'annexe I de la Loi devient l'alinéa *a*) et est modifiée par adjonction de ce qui suit :

Article	Colonne II Type de règlement applicable
16.	«*b*) Concentrations maximales pouvant être rejetées dans l'environnement»

[1] DORS/92-266, *Gazette du Canada* Partie II, 1992, p. 1939

9. All that portion of item 17[1] of the List of Toxic Substances in Schedule I to the Act in column II thereof is renumbered as paragraph (*a*) thereof and item 17 is further amended by adding thereto, in column II thereof, the following paragraph:

	Column II
Item	Type of Regulation Applicable
17.	"(*b*) Maximum concentrations that may be released into the environment"

9. La colonne II de l'article 17[1] de la liste des substances toxiques de l'annexe I de la Loi devient l'alinéa *a*) et est modifiée par adjonction de ce qui suit :

	Colonne II
Article	Type de règlement applicable
17.	«b) Concentrations maximales pouvant être rejetées dans l'environnement»

SCHEDULE I
(Subsection 6(1))

SAMPLING SCHEDULE FOR FINAL EFFLUENTS

1. Beginning on July 1, 1992 and ending on December 31, 1993, one 24-hour composite sample of the final effluent shall be collected during any day in which the chlorine bleaching plant is operating during the first month of each quarter of a given year.

2. Effective January 1, 1994, one 24-hour composite sample of the final effluent shall be collected during each month during any day in which the chlorine bleaching plant is operating, with a minimum of 21 days between any sample collection.

3. Effective January 1, 1995, subject to item 6, where no measurable concentration of 2,3,7,8-TCDD and no measurable concentration of 2,3,7,8-TCDF have been detected in the final effluent for the last three consecutive months, one 24-hour composite sample of the final effluent shall be collected once every quarter during any day in which the chlorine bleaching plant is operating.

4. Effective January 1, 1996, subject to item 6, where no measurable concentration of 2,3,7,8-TCDD and no measurable concentration of 2,3,7,8-TCDF have been detected in the final effluent for three consecutive quarters, one 24-hour composite sample of the final effluent shall be collected annually during any day in which the chlorine bleaching plant is operating, with a minimum of 350 days between any sample collection.

5. (1) An operator may commence the monthly sampling referred to in item 2, prior to January 1, 1994, and, after at least twelve consecutive monthly samples as described in item 2, may

(*a*) proceed to the quarterly sampling referred to in item 3, if the conditions required for quarterly sampling exist; and

ANNEXE I
(paragraphe 6(1))

CALENDRIER D'ÉCHANTILLONNAGE DES EFFLUENTS TERMINAUX

1. À compter du 1er juillet 1992 jusqu'au 31 décembre 1993, un échantillon composite de 24 heures de l'effluent terminal doit être prélevé le premier mois de chaque trimestre de l'année, au cours de n'importe quelle journée d'exploitation de l'usine de blanchiment au chlore.

2. À compter du 1er janvier 1994, un échantillon composite de 24 heures de l'effluent terminal doit être prélevé chaque mois, au cours de n'importe quelle journée d'exploitation de l'usine de blanchiment au chlore. L'intervalle entre les périodes d'échantillonnage doit être d'au moins 21 jours.

3. À compter du 1er janvier 1995, sous réserve de l'article 6, si aucune concentration mesurable de 2,3,7,8-TCDD et aucune concentration mesurable de 2,3,7,8-TCDF n'ont été décelées dans l'effluent terminal pendant trois mois consécutifs, un échantillon composite de 24 heures de l'effluent terminal doit être prélevé chaque trimestre, au cours de n'importe quelle journée d'exploitation de l'usine de blanchiment au chlore.

4. À compter du 1er janvier 1995, sous réserve de l'article 6, si aucune concentration mesurable de 2,3,7,8-TCDD et aucune concentration mesurable de 2,3,7,8-TCDF n'ont été décelées dans l'effluent terminal pendant trois trimestres consécutifs, un échantillon composite de 24 heures de l'effluent terminal doit être prélevé chaque année, au cours de n'importe quelle journée d'exploitation de l'usine de blanchiment au chlore. L'intervalle entre les périodes d'échantillonnage doit être d'au moins 350 jours.

5. (1) L'exploitant peut commencer l'échantillonnage mensuel prévu à l'article 2 avant le 1er janvier 1994 et peut, après avoir prélevé des échantillons au moins douze mois de suite conformément à cet article :

a) réduire la fréquence d'échantillonnage à un échantillon par trimestre conformément à l'article 3, si les conditions à cette fin qui y sont précisées sont respectées;

(*b*) proceed to annual sampling referred to in item 4, if the conditions required for annual sampling exist.

(2) If an accelerated schedule is followed as described in subitem (1), item 6 applies to that sampling schedule.

6. Where for any quarterly or annual samples there are measurable concentration of 2,3,7,8-TCDD or measurable concentration of 2,3,7,8-TCDF, one 24-hour composite sample of the final effluent shall be collected monthly until no measurable concentration of 2,3,7,8-TCDD and no measurable concentration of 2,3,7,8-TCDF have been detected for the period set out in item 3 or 4 at which time that item applies.

b) réduire la fréquence d'échantillonnage à un échantillon par année conformément à l'article 4, si les conditions à cette fin qui y sont précisées sont respectées.

(2) Lorsqu'un calendrier accéléré est suivi conformément au paragraphe (1), l'article 5 s'applique.

6. Si les échantillons prélevés chaque trimestre ou chaque année contiennent une concentration mesurable de 2,3,7,8-TCDD ou une concentration mesurable de 2,3,7,8-TCDF, un échantillon composite de 24 heures de l'effluent terminal doit être prélevé chaque mois jusqu'à ce qu'aucune concentration mesurable de 2,3,7,8-TCDD et aucune concentration mesurable de 2,3,7,8-TCDF ne soient décelées pendant la période visée aux articles 3 ou 4, après quoi s'appliquent les articles 3 ou 4, selon le cas.

SCHEDULE II
(Subsection 6(2))

INFORMATION ON THE CONCENTRATIONS OF SUBSTANCES

Item	*Congener*
	2,3,7,8-substituted PCDD
1.	2,3,7,8-TCDD
2.	1,2,3,7,8-P_5CDD
3.	1,2,3,4,7,8-H_6CDD
4.	1,2,3,6,7,8-H_6CDD
5.	1,2,3,7,8,9-H_6CDD
6.	1,2,3,4,6,7,8-H_7CDD
7.	OCDD
	Total PCDD
8.	TCDD
9.	P_5CDD
10.	H_6CDD
11.	H_7CDD
12.	OCDD
	2,3,7,8-substituted PCDF
13.	2,3,7,8-TCDF
14.	1,2,3,7,8-P_5CDF
15.	2,3,4,7,8-P_5CDF
16.	1,2,3,4,7,8-H_6CDF
17.	1,2,3,6,7,8-H_6CDF
18.	1,2,3,7,8,9-H_6CDF
19.	2,3,4,6,7,8-H_6CDF
20.	1,2,3,4,6,7,8-H_7CDF
21.	1,2,3,4,7,8,9-H_7CDF
22.	OCDF
	Total PCDF
23.	TCDF
24.	P_5CDF
25.	H_6CDF
26.	H_7CDF
27.	OCDF

ANNEXE II
(paragraphe 6(2))

RENSEIGNEMENT SUR LES CONCENTRATIONS DE SUBSTANCES

Article	*Congénère*
	PCDD chlorés aux positions 2,3,7,et 8
1.	2,3,7,8-TCDD
2.	1,2,3,7,8-P_5CDD
3.	1,2,3,4,7,8-H_6CDD
4.	1,2,3,6,7,8-H_6CDD
5.	1,2,3,7,8,9-H_6CDD
6.	1,2,3,4,6,7,8-H_7CDD
7.	OCDD
	PCDD totaux
8.	TCDD
9.	P_5CDD
10.	H_6CDD
11.	H_7CDD
12.	OCDD
	PCDF chlorés aux positions 2,3,7,et 8
13.	2,3,7,8-TCDF
14.	1,2,3,7,8-P_5CDF
15.	2,3,4,7,8-P_5CDF
16.	1,2,3,4,7,8-H_6CDF
17.	1,2,3,6,7,8-H_6CDF
18.	1,2,3,7,8,9-H_6CDF
19.	2,3,4,6,7,8-H_6CDF
20.	1,2,3,4,6,7,8-H_7CDF
21.	1,2,3,4,7,8,9-H_7CDF
22.	OCDF
	PCDF totaux
23.	TCDF
24.	P_5CDF
25.	H_6CDF
26.	H_7CDF
27.	OCDF

REGULATORY IMPACT ANALYSIS STATEMENT

(This statement is not part of the Regulations.)

Description

There are 75 compounds making up polychlorinated dibenzo-dioxins (dioxins) and 135 polychlorinated dibenzofurans (furans). Their basic chemical structures look very similar. Both the number of chlorine atoms and their positions relative to the carbon atoms of the substance determine their properties. One compound of each of these two families is being regulated. These compounds are produced when contaminants in process and feed material used in the production of pulp react with chlorine used in the bleaching process.

These two compounds are highly persistent with a strong affinity for sediments and a high potential for accumulating in biological tissues. They have been found in all compartments of the ecosystem, including air, water, soil, sediments, flesh of animals and food.

They are the first substances on the Priority Substance List to have been assessed for their toxicity as defined in Part II of the *Canadian Environmental Protection Act* (CEPA). The assessment concluded that these compounds are highly toxic and that they may enter the environment in quantities which have immediate and long term harmful effects on the environment and they constitute a danger to human health in Canada.

In light of the above, the departments of the Environment and National Health and Welfare published a summary of the assessment of these substances in the *Canada Gazette* Part I on March 17, 1990. This summary included a declaration in which the Ministers of Environment and National Health and Welfare announced that they would recommend to the Governor in Council that these compounds be added to the List of Toxic Substances, in Schedule I of the Act. It also recommended that regulations be made to control the release of these substances by pulp and paper mills, thereby reducing their discharge into the ecosystem.

The *Pulp and Paper Mill Effluent Chlorinated Dioxins and Furans Regulations* require all Canadian pulp and paper mills using chlorine bleaching to ensure that dioxins and furans in their effluents are not measurable. In most cases, mills will have to modify their processes to achieve this requirement.

Mills in operation prior to June 1, 1990, have to meet the standards by January 1, 1994, and must submit plans in order to be eligible for the 1994 date. These plans and schedules for the implementation of control measures are required to be submitted to Environment Canada within 60 days after the coming into force of these Regulations. Mills

RÉSUMÉ DE L'ÉTUDE D'IMPACT DE LA RÉGLEMENTATION

(Ce résumé ne fait pas partie du règlement.)

Description

Les dibenzodioxines polychlorées (dioxines) et les dibenzofurannes polychlorés (furannes) se composent respectivement de 75 et de 135 différents composés organiques dont la structure chimique de base est similaire. Les caractéristiques spécifiques de ces composés sont reliées au nombre d'atomes de chlore et à la position de ces derniers sur les molécules de carbone. Un composé pour chacune de ces deux familles de composés organiques est touché par le présent règlement. Ces composés sont formés suite à la réaction entre le chlore utilisé dans le processus de blanchiment et des impuretés ou d'autres composés présents au cours du processus de production de la pâte.

Ces deux substances sont très toxiques et ont la capacité de s'accumuler dans la chair des organismes vivants et dans les sédiments. Elles ont été retrouvées dans l'ensemble de l'écosystème i.e. dans l'air, l'eau, le sol, les sédiments, les aliments et dans la chair des animaux.

Ces substances sont les premières substances à être évaluées pour leur toxicité tel que prévu à la partie II de la *Loi canadienne sur la protection de l'environnement* (LCPE). L'évaluation a conclu que ces substances sont très toxiques et qu'elles peuvent s'infiltrer dans l'écosystème en quantité suffisante pour avoir des effets néfastes immédiats et à long terme sur l'environnement, et elles constituent un danger pour la santé au Canada.

Suite à ces faits, les ministères de l'Environnement et de la Santé nationale et du Bien-être social ont publié dans la *Gazette du Canada* Partie I le 17 mars 1990 une évaluation de ces substances. Ce sommaire comportait une déclaration par laquelle les ministres de l'Environnement et de la Santé nationale et du Bien-être social recommandaient au gouverneur en conseil que ces substances soient ajoutées à la liste des substances toxiques à l'annexe I de la Loi. De plus, ils recommandent que des mesures réglementaires soient prises afin de contrôler le rejet de ces substances par les usines de pâtes et papiers et par conséquent, minimiser leur infiltration dans l'écosystème.

Le Règlement concernant les dioxines et les furannes dans les effluents des fabriques de pâtes et papiers exige que toutes les usines utilisant un procédé de blanchiment au chlore s'assurent que le niveau de dioxines et de furannes dans leur effluent soit non mesurable. La majorité des usines devront modifier leur procédé de production afin d'être en conformité avec ces exigences.

Les usines qui étaient en exploitation avant le 1er juin 1990 auront jusqu'au 1er janvier 1994 pour se conformer au normes et devront soumettre des plans pour être admissibles à l'échéancier du 1er janvier 1994. Ces plans et des calendriers en vue de la mise en application de mesures appropriées devront être soumis à Environnement Canada, dans

starting operation after June 1, 1990, have to meet the regulatory standards upon promulgation of the regulations or at the time of start-up.

Alternatives Considered

Status quo

Dioxins and furans are extremely toxic and there is a need for action to protect the environment and human health. The industry has been successful in reducing the release of dioxins and furans, since their discovery in 1987, by over 90% and is looking at virtual elimination by 1993. However, Environment Canada cannot transfer its responsibility to phase them out to voluntary measures by the industry, hence the status quo option is not acceptable.

Regulatory limits selected

In order to be enforceable, regulations must refer to levels that can be verified. The "non measurable" concentration requirement set in these Regulations, for dioxins and furans, is the minimal value which can be certified with sufficient confidence for legal purposes. Concentrations which are "non-measurable" by today's best analytical technology are very low. The process changes and product substitution necessary to comply with these Regulations will prevent the formation of dioxins and furans in the bleaching process.

Consistency with Regulatory Policy and Citizens' Code

The objective of these Regulations is to protect the environment and human health. To this end, governments, the industry, environmental groups and the public have been invited to express their views and thus to assist in developing effective regulations that meet the needs and expectations of all concerned parties.

Given the toxicity of these substances, and their capacity to accumulate in the tissue of living organisms and in sediments, these Regulations represent the best option for achieving the objective of preventing the formation of dioxins and furans.

Early notice was provided through the 1990 Federal Regulatory Plan, proposal No. 181-EC.

Anticipated Impacts

Summary of Costs

A. *Costs for the private sector*

In order to comply with the requirements of these Regulations, 43 of the 47 mills will have to modify their bleaching process. It is estimated that a total capital investment of $568 million (1990 dollars) is required as shown in the following table. No additional operating cost is expected.

les 60 jours suivant l'entrée en vigueur du règlement. Les usines qui sont entrées en exploitation après le 1er juin 1990 devront être en conformité au moment de la promulgation du règlement ou devront être en conformité dès leur ouverture.

Solutions de rechange envisagées

Le statu quo

Le statu quo n'est pas acceptable en raison de l'extrême toxicité des dioxines et des furannes et du besoin d'avoir les moyens adéquats afin de protéger l'environnement et la santé au Canada. L'industrie a réussi à réduire, de 90% les rejets de dioxines et de furannes depuis leur découverte en 1987 et est en voie de virtuellement les éliminer d'ici 1993. Cependant, Environnement Canada ne peut se décharger de ses responsabilités à éliminer ces substances en se fiant à des mesures volontaires de la part de l'industrie.

Les limites réglementaires choisies

Les limites spécifiées au règlement doivent faire l'objet d'exigences telles que la respectabilité du règlement soit vérifiable. Les exigences de non-mesurabilité pour les dioxines et les furannes qui sont mentionnées au règlement sont le niveau minimal pouvant être certifié avec assez de confiance afin d'être utilisé à des fins légales. La meilleure technologie présentement disponible permet de s'assurer que le niveau de non-mesurabilité corresponde à des concentrations très faibles. Les changements au procédé de production et la substitution de produits, qui sont nécessaires afin de se conformer à la réglementation, préviendront la formation des dioxines et des furannes au cours du procédé de blanchiment.

Compatibilité avec la Politique de réglementation et le Code du citoyen

La réglementation vise à améliorer la protection de l'environnement et la santé. Pour ce faire, les gouvernements, l'industrie touchée, les organismes environnementaux et la population ont été invités à donner leur opinion et ont de ce fait collaboré à la rédaction d'un règlement répondant aux besoins et aux attentes des parties touchées.

Le règlement se justifie par le caractère toxique des substances à réglementer et leur capacité à s'accumuler dans les organismes vivants et dans les sédiments aquatiques. Cette réglementation représente donc la solution appropriée pour prévenir la formation de dioxines et de furannes.

Le préavis a été donné dans les Projets de réglementation fédérale 1990, numéro 181-EC.

Répercussions prévues

Sommaire des coûts

A. *Coûts pour le secteur privé*

Afin de se conformer au règlement, 43 des 47 usines utilisant un procédé de blanchiment au chlore devront modifier ce dernier. On évalue à 568 $ million les dépenses d'investissement nécessaires à la mise en application de ce règlement. Ces dépenses sont telles que listées dans le tableau qui suit. Aucun coût additionnel n'est prévu pour les frais d'exploitation.

INVESTMENT EXPENDITURES

Number of affected mills	Average expense per mill ($ 1990)	Total Expense ($ 1990)
2	$61,650,000	$123,300,000
41	$10,844,000	$444,600,000
4	$0	$0
47	$12,083,000	$567,900,000

The Regulations require that all mills provide Environment Canada with the results of monthly monitoring analyses for dioxins and furans in their final effluents. The net present value of this monitoring provision, evaluated over a 20 year period at a discount rate of 10%, is estimated at $9,038,000 (1990 dollars). These estimates represent the total maximum costs. Actual costs could be substantially less, since the Regulations include a provision stipulating that the sampling frequency may be decreased to once every calendar quarter (4 times a year) or to once a calendar year if test results, from the previous year, show that the regulatory limits have been respected. Under these last provisions the net present value is as follows:

COSTS FOR LOWER FREQUENCY ANALYSIS

Frequency of analysis	Net present value (20 years, 10%)
once a month ($ 1990)	$9,038,000
Once a quarter ($ 1990)	$4,353,000
Once a year ($ 1990)	$2,593,000

B. *Costs for the public sector to enforce the Regulations*

To enforce these Regulations, it is estimated that the government will require 20 additional person-years as well as the related operating and capital costs. These requirements are expected to total $2,000,000 (1990 dollars) per year. These person-years will be required to administer the information received from the mills, periodically inspect the mills, analyze samples which are periodically collected for auditing purposes, ensure that the reported data from mills correspond to government findings, deal with any accidental discharges and ensure that environmental protection measures are taken, and finally to provide appropriate information to the private sector and the public. The corresponding net present value of all these expenditures, evaluated for a period of 20 years at a discount rate of 10%, is estimated

DÉPENSES D'INVESTISSEMENT

Nombre d'usines touchées	Dépenses moyennes d'investissement par usine (1990 $)	Dépenses totales (1990 $)
2	61 650 000 $	123 300 000 $
41	10 844 000 $	444 600 000 $
4	0 $	0 $
47	12 083 000 $	567 900 000 $

Le règlement exige que toutes les usines procèdent mensuellement à des analyses sur la présence de dioxines et de furannes dans leur effluent final et qu'elles fournissent les résultats de ces analyses à Environnement Canada. La valeur actuelle nette de ces dépenses additionnelles, évaluée sur une période de 20 ans à un taux d'actualisation de 10 %, totalisera approximativement 9 038 000 dollars (dollars de 1990). Cette évaluation représente le coût total maximum car les coûts réels encourus pourraient être substantiellement moins élevés puisque le règlement comporte une clause qui stipule que la fréquence des échantillonnages peut diminuer à quatre (4) fois par année et à une fois par année dans le cas où les résultats d'analyses présentés à cours de l'année précédente démontrent que les teneurs prescrites n'ont en aucun temps été excédées. En vertu de ces dernières dispositions, la valeur actuelle nette est comme suit :

COÛTS À UNE FRÉQUENCE RÉDUITE D'ANALYSE

Fréquence d'analyse	Valeur actuelle nette (20 ans, 10 %)
Une fois par mois (1990 $)	9 038 000 $
4 fois par année (1990 $)	4 353 000 $
Une fois par année (1990 $)	2 593 000 $

B. *Coût au gouvernement pour la mise en application de ce règlement*

Suite à la mise en application du règlement, on estime que le gouvernement aura besoin de 20 années-personnes additionnelles en plus des frais d'investissement et d'exploitation sous-jacents. Ceci correspond à des dépenses additionnelles s'élevant à 2 000,000 dollars (dollars de 1990) par année. Les années-personnes supplémentaires devront administrer les renseignements reçus des usines, procéder à des inspections périodiques aux usines, analyser les échantillons prélevés périodiquement pour fins de vérifications. Elles devront également s'assurer que les résultats soumis par les papetières correspondent aux résultats des relevés gouvernementaux, se charger des rejets accidentels afin de s'assurer que des mesures de protection de l'environnement soient prises et finalement, répondre aux demandes de ren-

at $17,305,000 dollars (1990 dollars).

Summary of benefits

Allocative benefits

Benefits related to these Regulations are not quantified, but are substantial. They can be related to improvements in watercourse quality and are divided into two major categories.

The benefits mentioned below have not been quantified because there is not enough information to estimate the increase in revenues connected with fishing and with the positive impact of the regulations on various activities. A qualitative list is as follows:

1. *Benefits for the users of watercourses*
   - —Improved commercial and sport fishing as well as other recreational activities;
   - —Increased value of properties located close to affected watercourses;
   - —Reduction in future costs of restoring polluted watercourses;
   - —Reduced potential health risks; and
   - —Improved overall ecosystem quality.

An immediate benefit of these Regulations is related to the prevention of further fisheries closures as has occurred in British Columbia. It will also speed up the rehabilitation of closed fisheries, and will be of major importance for Natives as they partially depend on fisheries for their livelihood and for food supplies. Furthermore, the Department of Fisheries and Oceans jointly with other departments, such as Health and Welfare and Environment Canada, would eventually be able to reduce the issuing of advisories which limit the consumption of fish in specific affected areas.

2. *Benefits for non-users of watercourses*

The regulations will also affect non-users of the watercourses. The benefits include:
   - —the value society places on passing on to future generations improved environmental conditions;
   - —the "assurance value" of preserving the option to use water resources in the future; and
   - —the value placed on knowing that water quality has been improved.

These Regulations affect the pulp and paper industry that is the largest industrial user of water in Canada and the sector responsible for the largest source of pollution of

seignements en provenance du secteur privé et du public. La valeur actuelle nette de ces dépenses additionnelles, évaluée sur une période de vingt ans à un taux d'actualisation de 10 %, représente 17 305 000 dollars (dollars de 1990).

Sommaire des avantages

Répercussions réparties

Les avantages de cette réglementation ne sont pas quantifiés mais sont substantiels. Ils peuvent être reliés à l'amélioration de la qualité des cours d'eau et sont divisés en deux catégories principales.

Les avantages mentionnés plus bas, ne sont pas quantifiés parce que les renseignements disponibles ne sont pas suffisants pour évaluer l'augmentation des revenus tirés des pêches et l'impact positif de la réglementation sur les activités récréatives et sur les autres avantages sous-mentionnés. Une liste qualitative des avantages est comme suit :

1. *Les avantages des utilisateurs des cours d'eau*
   - —une amélioration pour les secteurs de la pêche commerciale et sportive de même que pour les activités liées au domaine récréatif;
   - —une augmentation des valeurs des propriétés foncières situées près des cours d'eau;
   - —une diminution éventuelle des coûts pour la remise en état des cours d'eau souillés;
   - —une réduction des risques potentiels pour la santé; et
   - —une amélioration générale de la qualité de l'écosystème.

À titre d'avantages immédiats, cette réglementation préviendra la fermeture de secteurs de pêche tels que ceux survenus en Colombie-Britannique et accélérera la réhabilitation des secteurs déjà fermés. Le règlement sera également d'une importance majeure pour les autochtones car la pêche est un de leurs moyens d'existence et de subsistance. De plus, le ministère des pêches et océans conjointement avec d'autres ministères tels que le ministère de la Santé et du Bien-être social et Environnement Canada seront éventuellement en mesure de réduire les mises en garde visant la réduction de la consommation de poissons dans des endroits précis.

2. *Les avantages liés aux non-utilisateurs de cours d'eau*

Ce règlement affectera également les non-utilisateurs des cours d'eau. Ces avantages sont :
   - —la valeur que la société accorde au fait qu'il sera possible de transmettre aux générations futures des conditions environnementales améliorées;
   - —la «valeur d'assurance» reliée à la possibilité d'avoir accès dans le futur à des cours d'eau environnementalement sains;
   - —la valeur placée sur le simple fait de savoir que la qualité de l'eau a été améliorée.

Cette réglementation affecte le plus important utilisateur d'eau au niveau industriel et le secteur économique qui est responsable de la plus importante source de pollution pour

watercourses. These Regulations have been developed to assist the government to meet its responsibility to ensure that the pollution burden is reduced.

These Regulations are justified because the benefits will be substantially increased in the future to the users and non-users of the watercourses.

Non-allocative impacts

Non-allocative impacts are those that do not affect the production or consumption possibilities of society but affect its distribution or composition.

—No disproportionate adverse impacts or burdens will be imposed on any firms or regions of the country.

—These Regulations will have no impact on inflation.

—It is expected that after the investment phase, the Regulations will create 48 new jobs in the equipment maintenance and repair field.

—These Regulations are expected to cause negligible changes in the industry's prices for its products. The Regulations will therefore not alter the size of the industry's output.

—The net impact of these Regulations on the forestry sector, as well as on the chemical sector (chemicals used for the bleaching process), is expected to be negligible.

—There will be no perceptible effects on the whole economy (real Gross Domestic Product (GDP) and total employment) in the short or long term.

Other effects of the Regulations

Any addition or changes to pollution control technologies designed to comply with these Regulations as well as any modifications within the production process, would assist in reducing environmental requirements related to other regulations in the pulp and paper sector.

Canada's major competitors are Sweden, Finland and the United States. Since Canada is the first among these countries to regulate dioxins and furans in its mills' effluent, it will be beneficial in terms of industrial competitiveness, because there is an increased demand for products that are made using technologies that minimize releases of dioxins and furans.

Consultation

Environment Canada recognizes the importance of consultation with all parties to be regulated and the beneficiaries of regulations, since it results in better and more effective regulations for the protection of the environment.

To this end, consultations have been held. They included distribution of various documents on the dioxins and furans

les cours d'eau. Ce règlement a pour objectif d'aider le gouvernement à assumer ses responsabilités quant à la réduction de la pollution.

Cette réglementation est jusufiée en raison de l'augmentation substantuelle, au cours des années qui viennent, des avantages qu'en tireront les utilisateurs et les non-utilisateurs des cours d'eau.

Répercussions non réparties

Il s'agit des répercussions qui affectent la distribution ou la composition des possibilités de production ou de consommation d'une société.

—Le fardeau financier relié à cette réglementation ne sera pas disproportionné par rapport à la taille des sociétés touchées ou aux régions du pays.

—Cette réglementation ne contribuera pas à augmenter l'inflation.

—En ce qui a trait à l'emploi, il appert que suite à la période d'investissement, cette réglementation sera responsable de la création de 48 nouveaux emplois. Ces emplois se concentreront dans la réparation et la maintenance d'équipements.

—L'impact de cette réglementation aura des conséquences négligeables sur les prix des produits de cette industrie; par conséquent le volume de production de ces usines ne sera pas affecté.

—Cette réglementation ne créera aucun effet perceptible sur les secteurs forestier et chimique (produits chimiques utilisés pour le blanchiment).

—L'ensemble de l'économie (Produit intérieur brut (PIB) réel et le niveau d'emploi) ne subira aucun effet perceptible à court et à long terme.

Autres conséquences de la réglementation

Pour être en conformité avec ce règlement, des ajouts ou des changements peuvent être effectués au niveau de la technologie reliée au contrôle de la pollution de même que des modifications peuvent être faites au niveau du procédé de production. Ces changements ou ajouts pourraient faciliter l'atteinte de normes environnementales reliées à d'autres règlements dans le secteur des pâtes et papiers.

Les plus importants compétiteurs du Canada sont la Suède, la Finlande et les États-Unis. Le Canada étant le premier parmi ces pays à réglementer les dioxines et les furannes au niveau des effluents des usines, ceci sera bénéfique au niveau de la compétitivité en raison de la possibilité d'une augmentation de la demande pour des produits fabriqués à partir d'une technologie minimisant tous rejets de dioxines et de furannes.

Consultation

Environnement Canada reconnaît que le fait de consulter les parties à réglementer et les bénéficiaires résulte en des règlements de protection de l'environnement qui sont réalistes et efficaces.

À cet effet, des consultations ont été tenues et ont inclu la distribution de différents documents portant sur les

issue. Meetings were also held with concerned federal departments, representatives of the Canadian Pulp and Paper Association and other non-governmental environmental organizations. Further to the distribution of the draft regulations, public hearings in 14 cities across Canada were held.

In the course of these consultations, the industry's main comments were as follows:

—In general, the pulp and paper industry recognizes the urgency of the situation and is prepared to take all necessary action to eliminate and prevent the release of dioxins and furans.

—The industry would like to see the establishment of a single regulatory "window" representing the regulatory interests of both levels of government.

Discussions are currently taking place with the provinces to harmonize federal and provincial environmental control requirements and delivery. These negotiations are intended to simplify the enforcement and the implementation of these Regulations for both government and the private sector.

—The Regulations specify that any concerned mills shall not release into the environment any measurable concentrations of dioxins and furans in their final effluents. The industry is concerned that this limit could be reduced as analytical instrument capabilities improve over time, which could entail further substantial expenditures for the industry in the near future. The industry is also concerned in that the Regulations state that the standard reference method could be amended from time to time.

Any proposed changes to the standard reference method are normally done in consultation with the industry and other parties.

—The industry is also concerned about the fact that no decision has been made regarding whether or not other organochlorines such as Adsorbable Organic Halogens (AOX) in pulp mill effluent will be regulated.

In November 1991 the Assessment Report on Effluents from Pulp Mills using Bleaching was released. The assessment of the environmental and health impacts found that effluents discharged into the aquatic environment from bleached pulp mills represent a significant risk to the aquatic ecosystem. For that reason, effluents from pulp mills using bleaching have been declared toxic to the environment as defined in CEPA. There was insufficient data on which to draw conclusion regarding human health effects. The assessment could not establish a scientific basis for setting a federal AOX level. AOX as a measurement does not provide estimates of the potential toxicity, persistence, or bioaccumulation in the aquatic environment. As well, in the course of the assessment, several "information gaps" were identified which must be closed before appropriate controls can be applied. The federal and provincial governments, along with academia and the pulp and paper

dioxines et les furannes. Des rencontres ont également été organisées avec les ministères fédéraux touchés, avec des représentants de l'Association des producteurs de pâtes et papiers et d'autres organismes environnementaux non-gouvernementaux. Suite à la distribution du règlement en avril 1990, des audiences publiques se sont tenues dans 14 villes à travers le Canada.

Lors de ces consultations, les principaux commentaires émis par l'industrie étaient comme suit :

—L'industrie des pâtes et papiers en général reconnaît l'urgence de la situation et est prête à conjuguer tous les efforts voulus afin d'éliminer et de prévenir tous rejets pouvant contenir des dioxines et des furannes.

—L'industrie demande à répondre à un interlocuteur unique tout en satisfaisant aux deux niveaux de gouvernement.

Des discussions sont présentement en cours avec les provinces afin que soient harmonisées la mise en application et les exigences environnementales aux niveaux fédéral et provincial portant sur les rejets des dioxines et des furannes. Ces négociations ont pour but de simplifier la mise en application du règlement tant pour le gouvernement que pour le secteur privé.

—La réglementation précise qu'aucune papetière utilisant un procédé de blanchiment au chlore ne peut rejeter dans l'environnement un effluent terminal contenant des quantités mesurables de dioxines et de furannes. L'industrie est inquiète du fait que les limites de détection peuvent être réduites suite à l'amélioration de la capacité des instruments d'analyse ce qui pourrait entraîner des dépenses importantes pour l'industrie dans un avenir rapproché. L'industrie se soucie également du fait que le règlement stipule que la méthode de référence normalisée pourrait être modifiée de temps en temps.

Tous changements proposés à la méthode de référence normalisée font normalement l'objet de consultation avec l'industrie et les autres intervenants.

—L'industrie est également inquiète du fait qu'aucune décision n'a été prise quant à réglementer ou non les organochlorés tels que les halogènes organiques absorbables (HOA).

En novembre 1991, un rapport d'évaluation a été publié lequel portait sur les effluents des usines de pâtes utilisant un procédé de blanchiment. L'évaluation des effets sur la santé et le milieu ambiant a permis de conclure que les effluents rejetés dans l'environnement aquatique par les usines canadiennes de pâtes blanchies représentaient un risque considérable pour l'écosystème aquatique. Pour cette raison, ces effluents sont donc considérés toxiques aux termes de la LCPE. L'insuffisance de données ne permet pas de se prononcer quant aux effets sur la santé humaine. Selon le rapport d'évaluation, il n'existe aucun fondement scientifique pour l'établissement d'une norme fédérale sur les HOA. Les HOA en tant que paramètre ne permettent pas de fournir des estimations de la toxicité potentielle, de la persi-

industry have undertaken a cost-shared program to complete the necessary research. Once the data generated from these studies is available, the government will be in a position to determine if further steps need to be taken to protect the environment.

stance ou de la bioaccumulation dans l'environnement aquatique. En outre, au cours de l'évaluation des données, plusieurs lacunes ont été observées, et il faudra répondre à plusieurs questions avant de pouvoir prendre des mesures de contrôle adéquates. Les gouvernements fédéral et provinciaux conjointement avec des universités de même qu'avec l'industrie des pâtes et papiers ont entrepris un programme à frais partagés afin de compléter les recherches appropriées. Lorsque les résultats de ces recherches seront disponibles, le gouvernement sera en mesure de décider si des mesures additionnelles sont nécessaires pour protéger l'environnement.

The main comments of the environmental groups are as follows:

—The environmental groups strongly support the government's intention to limit the release of dioxins and furans.

—Some groups feel that the government should entirely prohibit the chlorine bleaching process because it has adverse effects on the environment. They take the view that the public is willing to accept unbleached products.

Environment Canada in line with its role and mandate is responsible to establish environmental quality objectives and to enforce the regulatory requirements. The industry is responsible for selecting the appropriate control measures to meet these requirements. Any interference on the part of the government to establish the technology to be used could distort the market and adversely affect the sector.

—The groups feel that the time allocated to the mills to comply with the Regulations is too long.

Environment Canada has established the compliance date based on an assessment of the time required to design, manufacture, install and bring the selected technology on line.

—They feel that there is no guarantee that the monitoring test results submitted by the mills will reflect the actual discharges.

Government inspectors will periodically monitor and audit test results provided to Environment Canada by the mills.

Les principales remarques faites par les représentants des groupes environnementaux :

—Les représentants des groupes environnementaux appuient fortement les intentions du gouvernement en vue de limiter les déversements de dioxines et de furannes.

—Certains groupes sont d'avis que le gouvernement devrait interdire le procédé de blanchiment de la pâte puisque ce procédé est néfaste à l'environnement et ils soutiennent que la population est prête à accepter des produits non blanchis.

En raison de son rôle et de son mandat, Environnement Canada est responsable de la mise en place d'objectifs visant une qualité environnementale et de faire respecter les mesures réglementaires. Le secteur privé est quant à lui responsable de choisir les mesures de contrôle appropriées pour que les limites réglementaires soient respectées. Toutes interférences de la part du gouvernement à exiger une technologie particulière pourrait causer des distorsions à l'intérieur du marché et des conséquences négatives au secteur privé.

—Les groupes environnementaux sont d'avis que le temps alloué aux usines pour se conformer est trop long.

Environnement Canada a choisi la date à laquelle les usines devront être en conformité en tenant compte du temps nécessaire pour concevoir, manufacturer, installer et mettre en opération la technologie choisie.

—Ils sont enfin d'avis qu'il n'y a rien qui nous garantisse que les comptes rendus qui seront remis par les usines seront conformes aux relevés réels.

Les inspecteurs du gouvernement surveilleront périodiquement et réviseront les résultats d'analyse fournis par les usines à Environnement Canada.

Further to the consultation sessions with the affected parties, the draft regulations were amended prior to publication in the *Canada Gazette* Part I. These changes were intended to clarify, simplify as well as to facilitate the enforcement of these Regulations.

Suite aux consultations avec les parties touchées, avant la publication de ce règlement dans la *Gazette du Canada* Partie I, les différentes ébauches de la réglementation ont été amendées. Ces modifications ont eu pour but de clarifier et de simplifier de même que de faciliter la mise en application de ce règlement tant pour les papetières touchées que pour le gouvernement.

In response to the *Canada Gazette* Part I of December 14, 1991 publication of the Regulations, the Pulp and Paper Association submitted a Notice of Objection requesting that a board of review be established to examine:

—the level of quantification for measuring levels of dioxins and furans; and

—the use of in-plant monitoring.

The Minister has decided against convening boards of review since both of these issues have been addressed in the final version of the Regulations.

Other comments from a number of stakeholders, including environmental groups, were generally supportive. Concerns, however, were raised about economic impacts and the need for a one-window approach for enforcement. As well, it was felt that the Regulations were not going far enough and that complete elimination of dioxins and furans and banning chlorine bleaching should be the approach used.

Compliance Mechanism

The *Pulp and Paper Mill Effluent Chlorinated Dioxins and Furans Regulations* are being made under the *Canadian Environmental Protection Act* (CEPA). As a result, they will be applied in accordance with the Enforcement and Compliance Policy for CEPA, published at the time the Act came into force.

The policy provides measures for promoting compliance with the regulations, including education and information, promotion of technology development and consultation on regulation development.

Enforcement will be ensured by regular inspections and monitoring to verify compliance and investigation of violations.

The means implemented to guarantee compliance with the Regulations includes periodic audit through inspections of pulp and paper mills as well as through periodic audit of monitoring test results submitted by mills. The inspectors' findings will be compared with the results provided by the mills to ensure consistency.

Response to violations is determined on the basis of the criteria set out in the enforcement policy, namely the nature of the violation, the effectiveness in achieving the desired result and consistency in enforcement. Violations which have no direct impact on human health or the environment, such as the failure to meet information-reporting requirements, could be the subject of warnings. More serious violations, such as exceeding the allowable limits that may have a major impact on human health or the environment, could be dealt with by prosecution.

Suite à la publication de ce règlement à la *Gazette du Canada* Partie I le 14 décembre 1991, l'Association des producteurs des pâtes et papiers a soumis un avis d'opposition demandant qu'une commission de révision soit mise sur pied afin d'examiner :

—le niveau de quantification pour mesurer les niveaux de dioxines et de furannes, et

—l'utilité d'avoir à faire un test avant le rejet final de l'effluent.

Le ministre a décidé de ne pas constituer une commission de révision étant donné que ces deux difficultés ont été résolues dans la version finale du règlement.

D'autres commentaires en provenance de divers groupes, incluant les groupes environnementaux ont en général démontré un appui au règlement. Des inquiétudes ont toutefois été soulevées au sujet des impacts économiques et le besoin d'un guichet unique d'application. On a aussi mentionné que le règlement n'était pas assez rigoureux et devrait complètement éliminer les dioxines et les furannes et défendre le blanchiment au chlore.

Mécanisme de conformité

Le *Règlement concernant les dioxines et les furannes dans les effluents des fabriques de pâtes et papiers* est promulgué en vertu de la *Loi canadienne sur la protection de l'environnement* (LCPE); par conséquent son application sera conforme à la politique d'application de la LCPE, publiée à l'entrée en vigueur de cette Loi.

La politique donne les mesures de promotion du respect du règlement, ce qui inclut l'éducation et l'information, la promotion de la mise en valeur des techniques et la consultation sur l'élaboration des règlements.

L'application se fera par des inspections et contrôles périodiques de l'observation ainsi que des enquêtes sur les infractions.

Les moyens mis en œuvre pour garantir l'observation du règlement comprennent des inspections périodiques de la part des inspecteurs gouvernementaux ainsi que des comptes rendus fournis périodiquement par les usines touchées. Les résultats des inspections seront comparés aux rapports fournis périodiquement par les usines de pâtes et papiers. Cette comparaison est nécessaire afin de s'assurer que les résultats des usines et les relevés des inspecteurs du gouvernement sont comparables.

Les moyens mis en œuvre pour la répression des infractions seront conformes aux critères énoncés dans la politique d'application, soit la nature de l'infraction, l'efficacité des moyens employés pour obliger le contrevenant à obtemperer et l'uniformité d'application. Les infractions sans incidence directe sur la santé ou l'environnement, par exemple le non-respect des exigences de compte rendu, pourraient faire l'objet d'avertissements. Les cas plus graves comme des concentrations qui dépasseraient celles allouées et qui pourraient avoir une incidence majeure sur l'environnement et la santé pourraient faire l'objet de poursuites judiciaires.

Contact Persons:

David Halliburton
Industrial Programs Branch
Conservation and Protection
Environment Canada
(819) 953-1128

Arthur Sheffield
Regulatory Affairs and Program Integration Branch
Conservation and Protection
Environment Canada
(819) 953-1172

Personnes-ressources :

David Halliburton
Direction des programmes industriels
Conservation et Protection
Environnement Canada
(819) 953-1128

Arthur Sheffield
Direction des Affaires réglementaires et intégration des programmes
Conservation et Protection
Environnement Canada
(819) 953-1172

QUEEN'S PRINTER FOR CANADA. OTTAWA. 1992

IMPRIMEUR DE LA REINE POUR LE CANADA. OTTAWA. 1992

Appendix II. Pulp and Paper EEM Expert Working Group (EWG) on Dioxins

Terms of Reference
Nov. 19, 1996

PURPOSE

The regions, the mills and the consultants have identified difficulties with some of the Environmental Effects Monitoring (EEM) requirements provided under the Cycle 1 "baseline" monitoring program. To address these concerns, the EEM Technical Management Committee is establishing Expert Working Groups to review the results of Cycle 1 evaluation, identify the technical difficulties and provide recommendations on modified or alternative approaches where existing approaches have proven to be unproductive or do not work. The recommendations from this Expert Working Group will provide the basis for the Cycle 2 requirements on Dioxins and Furans.

OBJECTIVES

As principal responsibilities the Expert Working Group will ensure that it:

- reviews the concept and purpose of the various requirements under the EEM program,
- reviews the Dioxins and Furans data as generated in Cycle 1;
- identifies the difficulties encountered by the consultants in meeting the program requirements;
- identifies any sampling related difficulties and provides alternative approaches;
- identifies any QA/QC related difficulties and provides alternative approaches;
- examines the rationale for sampling frequency and sampling where historical data indicates tissue dioxins levels below fish consumption guidelines;
- examines how a site-specific approach could be implemented for Dioxins and Furans;
- provides any other recommendations pertaining to Dioxins and Furans that will improve the quality and value of the data to be generated in Cycle 2.

OPERATING PRINCIPLES

The work of the Expert Working Group will follow the following principles:

1. The basis of the recommendations must be driven by Cycle 1 evaluation.
2. A nationally consistent approach must be respected while allowing for flexibility in addressing site-specific issues.

3. The recommendations must follow the monitoring variable selection criteria as well as the EEM program guiding principles as outlined on page 3 of EEM generic document, EPS 1/RM/18.

4. The principle that the EEM is a monitoring rather than a research program should be reflected in the approach.

5. The recommendations must be finalized by April 1, 1997.

PROCESS

Meetings and teleconferences will be scheduled as required ahead of time but the process should allow flexibility to have meetings when required. Co-chairs will be responsible to jointly prepare the agenda.

The EWG will be responsible to provide its own secretariat support and will decide on its structure.

PARTICIPANTS

The Expert Working Group (7-8 people) will attend meetings/teleconferences as required starting in October and extending until the completion of the recommendations. Additional individuals may be consulted from time to time on specific issues on an *ad hoc* basis. In addition to their technical and scientific expertise, participants will be expected, from time to time, to provide the Expert Working Group with secretarial support (e.g., taking minutes of meetings, writing sections of the Recommendations Report).

Before committing to these groups, potential participants must ensure that they can attend all of the scheduled meetings and teleconferences.

Current list of participants:

Mark Servos (DOE-NWRI) (Co-chair)
Corinne Luthe (PAPRICAN) (Co-chair)
Dave Sargeant (DFO-GLLFAS)
Mike Ikonomou (DFO-Pacific and Yukon)
Al Colodey (DOE-Pacific)
Wayne Fairchild (DFO-Maritimes, as required)
Sherry Walker (DOE-Ottawa)

FINAL REPORT

A report summarizing the Expert Working Group's results and recommendations will be prepared by the Group and distributed to the EEM Technical Management Committee by April 1, 1997.

Appendix III: Requirements for dioxin analysis and sampling in EEM Cycle 1.

The following are the original requirements for dioxins analysis in Cycle 1 and are taken from Annex 1 (Aquatic Environmental Effects Monitoring Requirements, Annex 1, May 20, 1992):

9.1 TISSUE ANALYSES: CHLORINATED DIOXIN AND FURAN CONGENERS

Pulp mills which continue to use, or have used, chlorine bleaching must conduct analysis of tissue levels of chlorinated dioxin and furan congeners on edible portions of fish. Species selected for analyses and that portion of the fish constituting the edible portion will be decided on a site-specific basis. The species selected, however, should have commercial or recreational importance. If the plume affects waters supporting shellfish that may be consumed by humans (e.g., lobsters, oysters, mussels, clams, crabs, etc.), then these species may be selected.

Chemical analyses for the congeners specified in Table 6 must be measured in accordance with the performance criteria provided and must be consistent with the QA/QC requirements specified in Section 6. For the first EEM cycle, analyses will be conducted on a composite sample of 10 individuals of a single species from the near-field area and reference area. Performance criteria to be achieved by a laboratory conducting analysis of chlorinated dioxins and furans on fish tissue are identified in Table 6.

Where mills are already engaged in monitoring programs to assess levels of dioxins and furans in fish tissue to conform with other federal or provincial requirements, then the existing program shall take precedence, providing it conforms with the performance requirements of this Annex.

TABLE 6: REPORTING REQUIREMENTS FOR CHLORINATED DIOXINS AND FURANS

VARIABLE	MATRIX DETECTION LIMIT	PRECISION	ACCURACY
2,3,7,8-substituted PCDD[a]			
2,3,7,8-TCDD	1 pg/g	± 20 %	40 - 120 %
1,2,3,7,8-P_5CDD	5 pg/g		
1,2,3,4,7,8-H_6CDD	5 pg/g		
1,2,3,4,6,7,8-H_7CDD	5 pg/g		
O_8CDD	20 pg/g		
Total PCDD[b]			
TCDD	1 pg/g	± 20 %	40 - 120 %
P_5CDD	5 pg/g		
H_6CDD	5 pg/g		
H_7CDD	5 pg/g		
O_8CDD	20 pg/g		
2,3,7,8-substituted PCDF[c]			
2,3,7,8-TCDF	1 pg/g	± 20 %	40 - 120 %
1,2,3,7,8-P_5CDF	5 pg/g		
2,3,4,6,7,8-H_6CDF	5 pg/g		
1,2,3,4,6,7,8-H_7CDF	5 pg/g		
O_8CDF	5 pg/g		
	20 pg/g		
Total PCDF[d]			
TCDF	1 pg/g	± 20 %	40 - 120 %
P_5CDF	5 pg/g		
H_6CDF	5 pg/g		
H_7CDF	5 pg/g		
O_8CDF	20 pg/g		

[a] 2,3,7,8-substituted PCDD means any polychlorinated dibenzo-para-dioxin that has the molecular formula $C_{12}H_{8-n}Cl_nO_2$, in which "n" is not less than 4 and not more than 8 and chlorine atoms are located at the 2,3,7,8 positions on the molecule;

[b] Total PCDD means the sum of the concentrations of all polychlorinated dibenzo-para-dioxin congeners that have the molecular formula $C_{12}H_{8-n}Cl_nO_2$, in which "n" is not less than 4 and not more than 8;

[c] 2,3,7,8-substituted PCDF means any polychlorinated dibenzofuran that has the molecular formula $C_{12}H_{8-n}Cl_nO_2$, in which "n" is not less than 4 and not more than 8 and chlorine atoms are located at the 2,3,7,8 positions on the molecule;

[d] Total PCDF means the sum of the concentrations of all polychlorinated dibenzofuran congeners that have the molecular formula $C_{12}H_{8-n}Cl_nO_2$, in which "n" is not less than 4 and not more than 8.

Appendix IV: Summary of Cycle 1 results

Table 1. Fish species used in EEM adult fish surveys and dioxin/furan analyses and their identification codes.

Common name	Scientific name	Code
brown bullhead	*Ictalurus nebulosis*	BBH
burbot	*Lota lota*	BRT
channel catfish	*Ictalurus punctatus*	CCF
longnose sucker	*Catostomus catostomus*	LNS
largescale sucker	*Catostomus macrocheilus*	LSS
lake whitefish	*Coregonus clupeaformis*	LWF
mountain whitefish	*Prosopium williamsoni*	MWF
northern pike	*Esox lucius*	NP
shorthead redhorse sucker	*Moxostoma macrolepidotum*	ShRS
smallmouth bass	*Micropterus dolomuei*	SMB
walleye	*Stizostedion vitreum*	Wall
white sucker	*Catostomus commersoni*	WhS
yellow perch	*Perca flavescens*	YP
black cod	*Anoplopoma fimbria*	BC
blue mussel	*Mytilus edulis*	BM
dogfish	*Squalus acanthias*	DF
Dungeness crab	*Cancer magister*	DuCr
dusky rockfish	*Sebastes ciliatus*	DRF
English sole	*Parophrys vetulus*	ES
green crab	*Carcinus maenas*	GC
quillback rockfish	*Sebastes maliger*	QBR
ratfish	*Hydrolagus colliei*	RF
rock crab	*Cancer irroratus*	RC
rock sole	*Lepidopsetta bilineata*	RS
tomcod	*Microgadus tomcod*	TC
widow rockfish	*Sebastes entomelas*	WRF

Table 2. Summary of dioxin/furan monitoring for EEM Cycle 1

Notes:

"Bleaching" is that used at time of analysis

See Table 1 for key to species codes.

NR=not reported ND=not detected NA=not applicable (analysis not conducted at that mill)

Analysis was conducted on muscle tissue unless otherwise indicated.

Mill, Location	Type	Bleaching	Sentinel species	Species analysed	# of sites	samples per site	#fish/ sample	% Lipid	Biological data incl?	TEF used
Ontario Mills, freshwater:										
Avenor Dryden	Kraft		WhS, Wall	WhS	2	1	10	0.7, 1.1	N	
Avenor Thunder Bay	Kraft		WhS, LNS	WhS	2	1	10	1.5, 1.2	N	
Domtar Cornwall	Kraft	Cl, ClO2	YP,WhS	YP	3	1	4 to 10	NR	N	
Domtar Cornwall	Kraft	Cl,ClO2		WhS	3	1	10	NR	N	
Domtar Red Rock	Kraft	unbl (1992)	WhS, LNS	WhS	2	1	10	NR	Y	
EB Eddy Espanola	Kraft		Wall, WhS	Wall	2	1	10	NR	N	
4 Mills St Catharines		unbl (1993)	ShRS	ShRS	3	1	10	NR	N	
James River Marathon	Kraft	100% ClO2	LNS,LWF	LNS	3	1	10	2.2,1.8,1.2	N	
Kimberly-Clark Terrace Bay	Kraft	Cl	WhS, LNS	WhS	2	1	10	2.3, 1.0	N	
Mallette Smooth Rock Falls	Kraft	ClO2	WhS,Wall	report not available						
Spruce Falls Kapuskasing	Kraft		Wall, WhS	Wall	2	1	9 to 10	NR	N	
Stone Ft Frances	Kraft	ClO2 (1991)	Wall, WhS	Wall	2	1	10	1.1, 0.9	N	
Stone Ft Frances	Kraft	ClO2 (1991)	Wall, WhS	WhS	2	1	10	1.4, 1.2	N	
Prairie Mills, freshwater:										
D-M Int'l, Peace R. AB	Kraft	<70% ClO2	LNS, BRT	Wall	2	1	10	0.8, 0.9	Y	
Weyerhaeuser Prince Albert SK	Kraft		Whs, Wall	Wall	2	4	1 to 10	0.66, 0.18	N	
Weyerhaeuser Prince Albert SK	Kraft		Whs, Wall	WhS	2	4	1 to 10			
Weyerhaeuser Grande Prairie AB	sulphite/grdwd		MWF,LNS	MWF	2	1	10	NR	N	
Weyerhaeuser Grande Prairie AB	sulphite/grdwd		MWF,LNS	LNS	2	1	10	NR	N	
Weldwood Hinton AB	Kraft			MWF	2	1	10	NR	N	
Atlantic Mills, freshwater:										
St Anne-Nackawic, NB	Kraft	ClO2 (1993)	WhS, YP	WhS	2	1	10	0.9,1.0	N	
Fraser Inc. Edmundston NB	sulphite/grdwd		WhS, YP	YP	3	1	10	NR	N	
Atlantic Mills, marine:										
Kimberly-Clark Boat Harbour NS	Kraft	Cl	RC, WFL	BM	2	1	10	7.5, 14.4	N	
Stora Forest Port Hawkesbury NS		ClO2 (1994)	RC, WFL	RC	2	1		NR	N	
Irving Pulp & Tissue Complex St John NB	Kraft		TC,GC	TC	5	1	10	NR	N	
Repap NB Kraft Miramichi NB	Kraft		TC, WhS	TC	3	1	10	NR	N	

Table 2. Summary of dioxin/furan monitoring for EEM Cycle 1

Mill, Location	Type	Bleaching	Sentinel species	Species analysed	# of sites	samples per site	#fish/ sample	% Lipid	Biological data incl?	TEF used
Quebec Mills, freshwater										
Domtar Lebel-sur-Quevillon	Kraft	60% ClO2	LNS,WhS	Wall	2	1	3 to 10	NR	Y	
Stone Wayagamack Trois-Rivieres	Kraft	ClO2 (1993)	WhS, ShRS	Wall	2	1	10	0 4, 0 4	Y	
Stone Pontiac	Kraft	Cl, ClO2	WHS, CCF	CCF	2	1	10	0 7,0 6	N	
Donohue St-Felicien	Kraft	ClO2 (1992)	BBH, WhS	Wall	2	3	3	NR	Y	
Cartons St Laurent LaTuque	Kraft	55% Cl	WhS,NP	NP	2	1	10	NR	N	
James Maclaren Thurso	Kraft	Cl	BBH,YP	YP	2	1	10	NR	N	
Papier Domtar Windsor	NR	NR	WhS, ShRS	SMB	3	1	10	NR	Y	
Tembec Temiscaming	CTMP	Cl	Wall, WhS	Wall	2	1	10	NR	Y	
BC Mills, marine										
Alberni Specialties	CTMP	peroxide		DuCr (hepatopancreas)	3	3	3 - 5	15		
				RF (liver)	1	2	5	75 - 88		
Crofton Division, Fletcher Challenge	Kraft	75-100% ClO2		DuCr (hepatopancreas)	6	12	1 - 10	9 6 - 11		
				ES (liver)	1	2	5	1 4 - 1 8		
Elk Falls, Fletcher Challenge	Kraft	100% ClO2		DuCr (hepatopancreas)	12	12	3 - 10	8 2		
				QBR (liver)	1	2	6	7 8 - 8 0		
Avenor, Gold River	Kraft	70% ClO2		WRF (liver)	2	2	10	1 8		
				DuCr (hepatopancreas)	7	12	5 - 6	2 3		
				DRF (liver)	1	2	5 - 7	13 - 19 4		
Harmac Pacific, Nanaimo	Kraft	100% ClO2		DuCr (hepatopancreas)	6	12	2 - 5	6 4		
				QBR (liver)	1	2	5	6 5 - 10 6		
Howe Sound P&P, Port Mellon	Kraft, TMP	60-100% ClO2		DuCr (hepatopancreas)	10	13	1 - 9	6 7		
				BC (liver)	1	2	6	20 - 37		
Powell River Div., Mac Blo	Kraft, CTMP	80-95% ClO2		DuCr (hepatopancreas)	4	6	1 - 5	2 1		
				RS (liver)	1	2	8 - 10	6 2 - 7		
Skeena Cellulose, Pr. Rupert	Kraft	40-100% ClO2		DuCr (hepatopancreas)	8	16	1 - 5	7 4		
				RS (liver)	1	2	6	12		
WPP, Woodfibre	Kraft	65-100% ClO2		DuCr (hepatopancreas)	2	4	5	8 6 - 13		
				DF (liver)	1	3	1 - 6	77 - 78		
BC Mills, freshwater										
Canfor, Prince George	Kraft	100% ClO2		Report lent out						
Cariboo, Quesnel	Kraft	100% ClO2		Report lent out						
Celgar, Castlegar	Kraft	100% ClO2		MWF (liver)	3	4	6	2 6		
				MWF	3	4	6	3 2		
				LSS (liver)	2	2	2 - 6	2		
				LSS	2	2	2 - 6	0 7		

Table 2. Summary of dioxin/furan monitoring for EEM Cycle 1

Mill, Location	Type	Bleaching	Sentinel species	Species analysed	# of sites	samples per site	#fish/ sample	% Lipid	Biological data incl?	TEF used
Crestbrook FP, Skookumchuck	Kraft	100% ClO2		MWF (liver)	4	4	6	3		
				MWF	4	4	6	1.1		
				LSS (liver)	4	4	6	6		
				LSS	4	4	6	2		
Eurocan, Kitimat	Kraft	unbleached		DuCr (hepatopancreas)	4	8	5	6.4 - 10		
Fletcher Challenge, Mackenzie	Kraft	100% ClO2		LSS	2	2	10	1.7		
Northwood, Prince George	Kraft	100% ClO2		Report lent out						
Weyerhaeuser, Kamloops	Kraft	100% ClO2		MWF	2	2	6			

Table 3. Species analysed, QA/QC data, concentrations of 2,3,7,8-TCDD and 2,3,7,8-TCDF and standard TEQs for Cycle 1 dioxin/furan monitoring.

Note:
"# Duplicates" is the number reported by consultant. In BC, most analyses were done by one lab which ran one duplacte for every 10-15 samples run.
"Precision" is as reported by consultants (calculated from duplicates).
Concentrations of TCDD and TCDF congeners are reported as "conc (detection limite/% surrogate recovery"
"TEQ in biota" is the standard toxic equivalent value (calculated assuming that the non-detectable congeners were actually absern, ie ND= 0 µg/L).
"% recovery"= the range of surrogate recoveries reported for reference and exposed site combined.
"Max DL" is maximum method detection limit reported, followed by the congener (e.g. HxCDD may be total hexachlorodibenzo-p-dioxin or a specific hexa-substituted congener)
NA= not applicable (analysis not conducted at mill) NR = not reported ND = not detected

Mill, Location	Species analysed	# duplicates	Precision	2,3,7,8-TCDD (ppt)		2,3,7,8-TCDF (ppt)		TEQ in biota(ppt)		% recovery	Max DL
				ref	exp	ref	exp	ref	exp		
Ontario Mills, freshwater:											
Avenor Dryden	WhS	1	68-110%	ND (0.66/77)	ND (0.96/73)	ND (0.61/93)	5 (NR/87)	0	0.5	73-117	1.1 (HxCDD)
Avenor Thunder Bay	WhS	1	90-103%	ND (0.61/78)	ND (0.51/83)	ND (0.52/85)	ND (0.43/93)	0.47	0.04	75-118	23 (HxCDD)
Avenor Thunder Bay	WhS	1	68-110%	ND (0.8/78)	ND (0.85/83)	ND (0.49/84)	ND (0.63/89)			73-116	2.4 (OCDD)
Domtar Cornwall Ref 1	YP	0	NR	ND (0.2/NR)	ND (0.2/NR)	0.2 (NR/NR)	0.5 (NR/NR)	0.05	0.13	NR	0.7 (HpCDD)
Domtar Cornwall Ref 2	YP	0	NR	ND (0.2/NR)		0.2 (NR/NR)		0.19		NR	0.8 (OCDD/F)
Domtar Cornwall Ref 1	WhS	0	NR	ND (0.3/NR)	ND (0.2/NR)	0.8 (NR/NR)	2.4 (NR/NR)	0.08	0.69	NR	0.8 (OCDD/F)
Domtar Cornwall Ref 2	WhS	0	NR	ND (0.1/NR)	ND (0.2/NR)	0.9 (NR/NR)	2.4 (NR/NR)	0.14	0.55	NR	0.4 (OCDD)
Domtar Red Rock	WhS	0	NR	ND (0.1/50)	ND (0.1/44)	0.8 (NR/57)	0.5 (NR/52)	0.18	0.15	38-71	0.4 (HpCDF)
EB Eddy Espanola	Wall	1	98-103%	ND (0.45/96)	0.66 (NR/76)	0.37 (NR/94)	2.3 (NR/73)	0.045	1.66	59-116	16 (HxCDF)
4 Mills St Catharines near-field	ShRS	0	NR	ND (0.2/36)	0.3 (NR/68)	ND (0.2/32)	1 (NR/70)	0.13	0.45	33-87	0.2 (several)
4 Mills St Catharines far-field	ShRS				ND (0.1/63)		0.7 (NR/63)		0.07		0.2 (several)
James River Marathon	LNS	1	68-110%	ND (0.53/80)	ND (2.3/80)	2.1 (NR/74)	4.0 (NR/74)	2.71	2.5	58-142	2.3 (TCDD)
James River Marathon	LNS				ND (6.3/74)		2.0 (NR/77)		0.27		existing diffuser 7 (PCDF)
Kimberly-Clark Terrace Bay	WhS	0	NR	ND (0.34/104)	ND (0.34/104)	0.65 (NR/99)	1.8 (NR/100)	0.065	0.182	73-115	future diffuser 14 (HxCDD)
Mallette Smooth Rock Falls		report not available									
Spruce Falls Kapuskasing	Wall	0	NR	ND (0.3/44)	ND (0.2/64)	0.3 (NR/45)	0.2 (NR/76)	0.04	0.02	39-106	0.3 (TCDD)
Stone Ft Frances	Wall	1	"acceptable"	ND (0.1/61)	ND (0.1/63)	ND (0.1/55)	ND (0.1/64)	ND	ND	26-103	0.9 (OCDD)
Stone Ft Frances	WhS			ND (0.1/62)	ND (0.1/76)	ND (0.1/54)	0.4 (0.1/79)	0.0008	0.2	40-105	0.6 (OCDD)

Table 3. Species analysed, QA/QC data, concentrations of 2,3,7,8-TCDD and 2,3,7,8-TCDF and standard TEQs for Cycle 1 dioxin/furan monitoring.

Mill, Location	Species analysed	# duplicates	Precision	2,3,7,8-TCDD (ppt)		2,3,7,8-TCDF (ppt)		TEQ in biota(ppt)		% recovery	Max DL
				ref	exp	ref	exp	ref	exp		
Prairie Mills, freshwater:											
D-M Int'l, Peace R. AB	Wall	1	NR	ND (0.1/85)	ND (0.1/63)	ND (0.1/67)	ND (0.1/67)	0.01	ND	67-120	0.3 (OCDD)
Weyerhaeuser Prince Albert SK	Wall	0	NR	0.3 in one sample						27-116	9.7 (OCDD)
Weyerhaeuser Prince Albert SK	WhS			ND (0.1/84)		ND (0.1/82)					14 (OCDD)
											sample may be ref or exp
Weyerhaeuser Grande Prairie AB	MWF	0	NR	ND (0.3/NR)	1.2 (0.1/NR)	1.4 (0.3/NR)	6.7 (0.1/NR)	0.94	2.11	NR	4.5 (DiCDD)
Weyerhaeuser Grande Prairie AB	LNS			ND (0.1/NR)	0.3 (0.1/NR)	0.1 (0.1/NR)	3.8 (0.1/NR)	0.3	0.87		0.7 (DiCDD)
Weldwood Hinton AB	MWF	0	NR	ND (0.3/NR)	0.8 (0.1/NR)	1.4 (0.3/NR)	3.3 (0.1/NR)	0.94	1.33	NR	4.5 (DiCDD)
Atlantic Mills, freshwater:											
St Anne-Nackawic, NB	WhS	NR	NR	ND (0.21/46)	ND (0.32/55)	ND (0.24/86)	0.5 (NR/75)	0.19	0.055	NR	8.2 (HxCDF)
Fraser Inc. Edmundston NB	YP	NR	NR	ND (1.48/-)	ND (1.4/-)	ND (1.18/-)	ND (1.29/-)	ND	ND	11.5-217	31.3 (OCDD)
Fraser Inc. Edmundston NB	YP			ND (0.84/-)		ND (0.6/-)		surrogate recoveries reported			
Atlantic Mills, marine:								but unclear for which sites			
Kimberly-Clark Boat Harbour NS	BM	NR	NR	Report not available							
Stora Forest Port Hawkesbury NS	RC	1	NR	ND (0.1/74)	ND (0.4/60)	ND (0.5/71)	ND (0.3/60)	ND	ND	43-93	<0.6
Irving Pulp & Tissue Complex	TC	NR	NR	ND (NR/NR)	ND (NR/NR)	ND (NR/NR)	ND (NR/NR)	0	0	40-90	0.8 (OCDD)
St. John NB										NR	NR
Repap NB Kraft Miramichi NB	TC	1	NR	ND (0.3/NR)	ND (0.3/NR)	0.5 (NR/NR)	ND (0.3/NR)	0.12	0	NR	5 sites, all ND 0.3 (TCDD/F)
Repap NB Kraft Miramichi NB	TC			ND (0.2/NR)		0.4 (NR/NR)		0.04		NR	ref 1 and exp ref 2
Quebec Mills, freshwater:											
Domtar Lebel-sur-Quevillon	Wall	NR	NR	ND (0.29/70)	ND (0.4/68)	ND (0.26/81)	ND (0.36/71)	0.015	0.2	68-100	0.68 (OCDD)
Domtar Windsor	SMB	NR	NR	ND (0.68/93)	ND (0.89/84)	ND (0.65/96)	1.0 (ND/88)	ND (0.58)	0.1	77-121	49 (HxCDF)
Stone Wayagamack Trois-Rivieres	Wall	NR	NR	ND (0.18/54)	ND (0.21/60)	ND (0.19/69)	ND (0.26/60)	0.204	0.233	60-86	3.9 (TCDF)
Stone Pontiac	CCF	NR	NR	0.22 (NR/60)	ND (0.21/56)	ND (0.24/68)	ND (0.22/57)	0.21	0.281	57-84	5.7 (HxCDF)
Donohue St-Felicien #1	Wall	1	NR	ND (0.1/86)	ND (0.2/72)	ND (0.1/103)	ND (0.1/84)	0	0	53-116	1.3 (OCDD)
Donohue St-Felicien #2	Wall			ND (0.2/88)	ND (0.2/73)	ND (0.1/100)	ND (0.1/83)	0	0		
Donohue St-Felicien #3	Wall			ND (0.2/65)	ND (0.2/76)	ND (0.2/72)	ND (0.2/81)	0.16	0.013		
Cartons St Laurent La Tuque	NP	NR	NR	ND (0.15/107)	ND (0.18/93)	ND (0.15/91)	0.16 (NR/79)	0.185	0.188	64-107	7.5 (PCDF)

Table 3. Species analysed, QA/QC data, concentrations of 2,3,7,8-TCDD and 2,3,7,8-TCDF and standard TEQs for Cycle 1 dioxin/furan monitoring.

Mill, Location	Species analysed	# duplicates	Precision	2,3,7,8-TCDD (ppt) ref	2,3,7,8-TCDD (ppt) exp	2,3,7,8-TCDF (ppt) ref	2,3,7,8-TCDF (ppt) exp	TEQ in biota(ppt) ref	TEQ in biota(ppt) exp	% recovery	Max DL
James Maclaren Thurso	YP	NR	NR	ND (0.5/49)	ND (0.1/31)	0.4 (NR/61)	0.8 (NR/35)	0.4	0.13	31-77	0.6 (HpCDD)
Tembec Temiscaming	Wall	NR	NR	ND (0.1/92)	ND (0.2/61)	ND (0.1/103)	ND (0.2/64)	0	0	55-110	1 (OCDD)
BC Mills, marine:											
Alberni Specialties	DuCr (hepatopancreas)	0		see Table 4 for congener concentrations from BC mills.				NA	44.8		
	RF (liver)	1						NA	25.3 - 21.6		
Crofton Division, Fletcher Challenge	DuCr (hepatopancreas)	1						NA	47.6 - 50.5		
	ES (liver)	0						NA	10.5 - 19.9		
Elk Falls, Fletcher Challenge	DuCr (hepatopancreas)	0						NA	22.7		
	QBR (liver)	0						NA	11.7 - 21.8		
Avenor, Gold River	WRF (liver)	0						1.02	0.28		
	DuCr (hepatopancreas)	0						NA	16.3		
	DRF (liver)	0						NA	5 - 6.5		
Harmac Pacific, Nanaimo	DuCr (hepatopancreas)	1						NA	2.8		
	QBR (liver)	0						NA	6.7 - 8.5		
Howe Sound P&P, Port Mellon	DuCr (hepatopancreas)	1						NA	60.9		
	BC (liver)	1						NA	31 - 51.7		
WPP, Port Alice	DuCr (hepatopancreas)										
Powell River Div., Mac Blo	DuCr (hepatopancreas)	1						NA	8.2		
	RS (liver)	0						NA	5.6 - 18.5		
Skeena Cellulose, Pr. Rupert	DuCr (hepatopancreas)	2						NA	32.8		
	RS (liver)	0						NA	8 - 8.9		
WPP, Woodfibre	DuCr (hepatopancreas)	0						NA	12.6 - 29.1		
	DF (liver)	1						NA	1366-2949		
BC Mills, freshwater:											
Canfor, Prince George	Report lent out										
Cariboo, Quesnel	Report lent out										
Celgar, Castlegar	MWF (liver)	0						0.1	3.6		
	MWF	1						0	5.4		
	LSS (liver)	0						0	0.3		
	LSS	0						0	0		
Crestbrook FP, Skookumchuck	MWF (liver)	0						11.6	6.5		
	MWF	0						3	3.5		

Table 3. Species analysed, QA/QC data, concentrations of 2,3,7,8-TCDD and 2,3,7,8-TCDF and standard TEQs for Cycle 1 dioxin/furan monitoring.

Mill, Location	Species analysed	# duplicates	Precision	2,3,7,8-TCDD (ppt) ref	2,3,7,8-TCDD (ppt) exp	2,3,7,8-TCDF (ppt) ref	2,3,7,8-TCDF (ppt) exp	TEQ in biota(ppt) ref	TEQ in biota(ppt) exp	% recovery	Max DL
	LSS (liver)	1						0.6	7.1		
	LSS	1						0	2.5		
Eurocan, Kitimat	DuCr (hepatopancreas)	0						NA	2.9 - 6.2		
Fletcher Challenge, Mackenzie	LSS							0	0.5		
Northwood, Prince George	Report lent out										
Weyerhaeuser, Kamloops	MWF	0						1.2	1.6		

Table 4. B.C. Coastal Dioxin and Furan Trend Monitoring Program Results - 1995
Tissue samples from all outfall sites (crab) and bottomfish sites.

B.C. Coastal Dioxin and Furan Trend Monitoring Program Results - 1995
Tissue samples from all outfall sites (crab) and bottomfish sites

Note: Samples were taken from outfall sites only for the B.C. program; there are no reference sites

Site Number	Species	Tissue	Lipid %	# in comp	2378 T4CDD pg/g	SDL pg/g	2378 T4CDF pg/g	SDL pg/g	TEQ pg/g
Crofton									
CF-C3	DUNGENESS CRAB	HEPATOPANCREAS	9.6	10	4.6	0.1	140	0.1	47.6
CF-C3	DUNGENESS CRAB	HEPATOPANCREAS	11	10	4.1	0.1	140	0.1	50.5
CF-T2	ENGLISH SOLE	LIVER	1.8	5	2.1	0.3	51	0.3	19.9
CF-T2	ENGLISH SOLE	LIVER	1.4	5	1.1	0.4	22	0.4	10.5
Elk Falls									
EF-C4	DUNGENESS CRAB	HEPATOPANCREAS	8.2	10	1.3	0.1	85	0.1	22.6
EF-T2	QUILLBACK ROCKFISH	LIVER	8	6	1.8	0.1	79	0.1	21.8
EF-T2	QUILLBACK ROCKFISH	LIVER	7.8	6	1.0	0.1	39	0.1	11.7
Eurocan									
ER-C2	DUNGENESS CRAB	HEPATOPANCREAS	10	5	ND	0.6	2.9	0.6	2.9
ER-C2	DUNGENESS CRAB	HEPATOPANCREAS	6.4	5	ND	0.6	5.1	0.6	6.2
Gold River									
GR-S5	DUNGENESS CRAB	HEPATOPANCREAS	2.3	5	ND	1.0	107	0.3	16.3
GR-S5	DUNGENESS CRAB	MUSCLE	0.3	5	ND	1.0	15.1	0.6	2.1
GR-S11	DUSKY ROCKFISH	LIVER	13	5	ND	1.5	26.5	1.5	5
GR-S11	DUSKY ROCKFISH	LIVER	19.4	7	2.3	1.5	30.4	1.5	6.5
Harmac									
HM-C3	DUNGENESS CRAB	HEPATOPANCREAS	6.4	2	0.9	0.5	20	0.2	8.1
HM-C3	DUNGENESS CRAB (female)	HEPATOPANCREAS	1.9	2	0.4	0.2	3.7	0.2	2.8
HM-T2	QUILLBACK ROCKFISH	LIVER	6.5	5	0.5 (NDR)	0.4	14	0.8	6.7
HM-T2	QUILLBACK ROCKFISH	LIVER	10.6	5	0.7	0.4	20	0.7	8.5
Howe Sound									
HS-C3	DUNGENESS CRAB	HEPATOPANCREAS	8.6	5	2.5	0.1	53	0.1	126
HS-C3	DUNGENESS CRAB	HEPATOPANCREAS	13	5	4.9	0.1	96	0.1	21.9

Table 4. B.C. Coastal Dioxin and Furan Trend Monitoring Program Results - 1995
Tissue samples from all outfall sites (crab) and bottomfish sites.

Site Number	Species	Tissue	Lipid	# in comp	2378 T4CDD	SDL	2378 T4CDF	SDL	TEQ
			%		pg/g	pg/g	pg/g	pg/g	pg/g
HS-C10	DUNGENESS CRAB	HEPATOPANCREAS	6.7	5	12	0.2	280	0.2	60.9
HS-C10	DUNGENESS CRAB	MUSCLE	0.13	5	0.5	0.1	9.9	0.1	2.2
HS-T2	BLACK COD	LIVER	26	1	6.1	0.3	74	0.3	24.6
HS-T2	SOLE	LIVER	17	6	4.1	1.5	83	1.5	19.4
HS-T2	DOGFISH	LIVER	78	3	320	0.2	8400	0.2	1366
HS-T2	DOGFISH	LIVER	77	3	660	0.2	18000	0.2	2949
HS-T9	BLACK COD #1	LIVER	20	6	12	0.1	58	0.1	31
HS-T9	BLACK COD #2	LIVER	37	6	19	0.1	110	0.1	51.7
HS-T9	BLACK COD #2 duplicate	LIVER	36	6	20	0.1	100	0.1	50.6
Port Alberni									
PA-C1	DUNGENESS CRAB	HEPATOPANCREAS	15	3	3.9	0.1	41	0.5	44.8
PA-T2	RATFISH #1	LIVER	75	5	7.7	0.1	140	0.1	25.3
PA-T2	RATFISH #2	LIVER	88	5	6.5	0.1	200	0.1	31.6
PA-T2	RATFISH #2 duplicate	LIVER	88	5	7.1	0.1	210	0.1	29.5
Powell River									
PR-C4	DUNGENESS CRAB	HEPATOPANCREAS	2.1	4	0.4	0.1	69	0.1	8.2
PR-LL1	BROWN ROCKFISH	LIVER	6.2	10	1.6	0.1	64	0.1	18.1
PR-LL1	ROCK SOLE	LIVER	7	8	ND	0.1	27	0.1	5.5
Skeena									
SK-SC3	DUNGENESS CRAB	HEPATOPANCREAS	7.4	5	7.2	0.1	170	0.1	32.8
SK-SC3	DUNGENESS CRAB duplicate	HEPATOPANCREAS	7.4	5	6.6	0.1	170	0.1	32.4
SK-ST2	ROCK SOLE	LIVER	12	6	2.4	0.2	40	0.2	8.9
SK-ST2	ROCK SOLE	LIVER	12	6	2.2	0.2	37	0.2	8.0

Appendix V. Overview of Health Canada's Fish Consumption Guideline for Dioxins

Health Canada uses a guideline of 15 ppt expressed as 2,3,7,8-TCDD TEQs to limit the consumption of fish muscle tissue and a guideline of 30 ppt and 80 ppt for the consumption of hepatopancreas and viscera, in crab and lobster, respectively (C. Dalpé, Health Canada, pers. comm.). These guidelines, which are currently under review by Health Canada, were determined by calculating a tolerable daily intake (TDI) and a probable daily intake (PDI).

Health Canada recommends a Tolerable Daily Intake (TDI) of 10 pg/kg BW/d. The TDI is the quantity of a substance that can be ingested every day during a lifetime with reasonable assurance that such exposure would not pose a health hazard. This TDI is based on a NOAEL of 0.001 µg/kg BW/d from a carcinogenicity study and a multi-generation reproduction study with rats and the application of a safety factor of 100 to allow for intraspecies and interspecies variability. The toxicity of dioxin and furan congeners relative to that of 2,3,7,8-TCDD is taken into consideration through the use of International Toxicity Equivalency Factors (ITEF) recommended by NATO (Dalpé 1994; Kutz et al. 1992).

The probable daily intake (PDI) is calculated using an average fish consumption of 40 g/d, an average body weight for an adult of 60 kg, and the ITEFs applied to the dioxin and furan congeners measured in fish and shellfish. The PDI of 600 pg/person/d equates with a residue level in fish muscle tissue of 15 ppt. For hepatopancreas of crab or viscera of fish, a consumption rate of 20 g/d is used resulting in a guideline of 30 ppt (Dalpé 1994; Dalpé, p0rs. comm., Health Canada).

References:

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